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SOURCESRESOURCES ABSTRACTS



VOLUME 6, NUMBER 10 MAY 15, 1973 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior



VOLUME 6, NUMBER 10 MAY 15, 1973

W73-05851 -- W73-06500

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

WATER RESOURCES ABSTRACTS

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established disciplineoriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Rioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

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Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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SUBJECT FIELDS AND GROUPS

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01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation: Chemical Processes: Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

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Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand: Water Law and Institutions; Nonstructural Alter-

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SELECTED WATER RESOURCES ABSTRACTS

02. WATER CYCLE

2A. General

LINK BETWEEN STOCHASTIC AND PARAMETRIC HYDROLOGY, Pittsburgh Univ., Pa. Dept. of Civil Engineering. R. G. Quimpo.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9602, p 461-470, March 1973. 3 fig, 1 tab, 21 ref, append. NSF Grant GK-20388.

Descriptors: *Stochastic processes, *Parametric hydrology, *Mathematical models, *Statistical models, *Unit hydrographs, Water storage, Simu-lation analysis, Regression analysis, Time series analysis, *Pennsylvania. Identifiers: *Ashbrook catchment (Penn).

The linkage between stochastic and parametric hydrology models is investigated using autocorrelation analysis. A conceptual unit hydrograph model consisting of n linear reservoirs in cascade leads to an autoregressive time series which may be used for generating synthetic streamflow. Thus, the stochastic model parameters are related to the storage characteristics of the basin. The theory is verified using Nash's data on the Ashbrook catchment and two floods in a Pennsylvania watershed. (Knapp-USGS)

HYDROLOGIC CONDITIONS DURING 1971 IN HYDROLOGIC CONDITIONS DURING 19/1 IN DADE COUNTY, FLORIDA, Geological Survey, Tallahasee, Fla. J. E. Hull, and E. T. Wimberly. Geological Survey Open-file Report 72024, 1972. 104 p, 39 fig, 8 tab, 12 ref.

Descriptors: "Hydrologic data, "Water yield, "Water quality, "Rainfall-runoff relationships, "Florida, Surface waters, Groundwater, Stream-flow, Flow rates, Water wells, Water table, Pump-ing, Water level fluctuations, Saline water intru-sion, Chemical analysis, Data collections. Identifiers: "Dade County (Fla).

Identifiers: *Dade County (Fla).

During the 1971 calendar year, rainfall in Dade County, Florida, was 14.47 inches below the long-term average. Groundwater levels ranged from average to 1.5 feet below average. The highest and lowest groundwater levels for the year were both 1 foot below their long-term averages. In the Hialeah-Miami Springs area, groundwater levels in wells near the centers of the heaviest pumping ranged from 7.6 to 8.9 feet below msl; and in the southwest well field area, groundwater levels near the centers of pumping ranged from 0.4 foot above to 4.9 feet below msl. In the 1971 water year, the combined average daily discharge from five major streams and canals that flow into Biscayne Bay was 540 cfs, 1,215 cfs below the combined average daily flow for the 1970 water year. The combined average daily flow whough the Tamiami Canal outlets was 456 cfs, next to the lowest of record, and 2,603 cfs below that of the 1970 water year. From 1970 to 1971 the salt front remained stationary in the Oleta River area. (Woodard-USGS)

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, New Mexico Inst. of Mining and Technology, Secorro. Dept. of Geoscience.

D. Rabinowitz, and G. W. Gross.
New Mexico Water Resources Research Institute, Las Cruces, Report 016, 1972. 268 p. 41 fig. 17 teb, 88 ref, 10 append. OWRR A-037-NMEX (1).

Descriptors: *Tritium, *New Mexico, Hydrologic models, Groundwater, Groundwater recharge,

Groundwater movement, Groundwater flow, Natural recharge, Precipitation (Atmosphere), Geohydrologic units, Meteorological data, Per-colation, Porosity, Transmissivity, Aquifers, Arte-sian aquifers, Radio active dating, Half-life, Elec-trolysis, Model studies.

trolysis, Model studies. Identifiers: "Groundwater tracer, Tritium concentrations, "Tritium-time profiles, Tritium input function, Tritium fallout profile, "Roswell artesian basin, "Pecos basin, "Recharge estimations, Residence time, Groundwater velocity, Lithologic, Dispersion constant, One-dimensional dispersion model, Water tracer, Environmental tritium, Dispersive model, Confined limestone aquifer, Natural radioactive hydrogen.

A tritium input function for the Roswell artesian A tritium input function for the Roswell artesian basin was constructed from tritium analysis of precipitation and groundwater samples taken over 13 years, together with geohydrologic and meteorologic data. This recharge function, rather than tritium concentrations in precipitation, was correlated with tritium-time profiles of seven wells, which were also correlated among each other. Recharge was not a linear function of precipitation by proportional to a named forcion. precipitation but proportional to an annual fraction of the mean. Two distinct subregions, characterist the distinct subregions, characterist the distinct subregions of the mean. of the mean. Two distinct subregions, charac-terized by different circulation patterns, were recognized in the basin. The residence time of water in the northern subregion (Roswell) was about four years, and larger than seven years in the central region (Artesia). Tritium input charac-teristics varied from north to south along the western flank of the basin. In the recharge area of the northern subregion, percolation from surface to water table was between 4-12 months. Hydrological parameters computed on the basis of tritium data were correlated with lithologic and structural features in the basin, in the northern structural features in the basin. In the northern structural features in the basin. In the northern part of the basin average ground water velocity, porosity, effective thickness of the aquifer, and the dispersion constant were found to be of the order of 70 ft/day, 1%, 2 ft and 70 ft, respectively. A one-dimensional dispersion model was successfully used to test the precipitation/recharge relation using tritium as a tracer. (Creel-New Mexico State) State) W73-06022

PREDICTING PEAK FLOW OF SMALL WATERSHEDS BY USE OF CHANNEL CHARACTERISTICS, Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 02E. W73-06027

APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO AN URBANIZING WATERSHED, Clemson Univ., S.C. Water Resources Research

For primary bibliographic entry see Field 04C. W73-06028

THERMAL DISPERION IN A STREAM

MODEL,
Rutgers - The State Univ., New Brunswick, N.J.
Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02E.
W73-06099

RESPONSES HYDROGRAPH TO GEOMORPHIC MODEL WATERSHED CHARACTERISTICS AND PRECIPITATION VARIABLES, State Univ. of New York, Syracuse. Coll. of Forestry. P. E. Black

Journal of Hydrology, Vol 17, No 4, p 309-329, December 1972. 6 fig, 37 ref.

Descriptors: "Railfall simulators, "Railfall-runoff relationships, "Model studies, "Hydraulic models, Peak discharge, Water yield, Simulated rainfall, Topography, Hydrograph analysis, Slopes.

Topography, Hydrograph analysis, Slopes.

A watershed model studies project studied the effect of selected watershed characteristics on hydrograph parameters under a rainfall simulator. Because most of the runoff contributing to the peak flow emanated from the lower half of the drainage, a measure of watershed eccentricity utilizing easily measured properties in that area was derived and evaluated as a reliable predictor of peak magnitude. Watershed shape, alope, size drainage pattern, and soil depth were isolated and, along with rainfall intensity, direction of storm movement, and antecedent moisture conditions, were evaluated for the models. The models exhibit hydrologic responses similar to those of a wide range of real watersheds. Watershed shape, of itself, does not have a large effect on peak magnitude. Watershed eccentricity is an effective, easily measured, meaningful, and useful expression of watershed shape which reflects maximum peak flows and time parameters of the hydrograph. (Knapp-USGS)

CONSTANT-HEAD FLOATING-SIPHON STAGE-RECORDING SYSTEM,

STAGE-RECURIENT STATES Illinois Univ., Urbana. B. C. Yen, Y-Y Shen, and V. T. Chow. Journal of Hydrology, Vol 17, No 4, p 257-281, December 1972. 6 fig. 1 tab, 5 ref. NSF Grant GK-

Descriptors: "Discharge measurement, "Flow control, "Hydraulics, "Siphons, "Discharge (Water), Stage-discharge relations, Hydraulic models, Rainfall-runoff relationships.
Identifiers: "Constant-head siphons, "Siphons (Floating).

A constant-head floating siphon together with a stage recording device was built for flow measurement and control for the Watershed Experimentation System at the University of Illinois. The remoff from the laboratory watershed is collected in a storage tank. The constant-head, floating-aiphon, stage-recording system is used to discharge water from the tank, thus avoiding undesirable features of pumping at uncontrollable variable rates. The system records simultaneously the water level. Other applications include divervariable rates. The system records simultaneously the water level. Other applications include diversion of water from a river or canal, selective withdrawal at a constant flow rate from a reservoir, constant discharge to ensure fulfillment of downstream water-right requirements, and selective diversion at constant flow rate of storm sewer runoff for sewage treatment. As predicted by theory, variation of the discharge for the system tested is 0.1% or less. The most critical condition concerning the sensitivity is at incipient motion of a falling stage which requires a fall of 0.069 cm (0.027 inch) of water surface for the system to respond. (Knapp-USGS)

THE RATIONAL METHOD OF FLOOD ESTI-MATION FOR NEW SOUTH WALES, New South Wales Univ., Sydney (Australia). School of Civil Engineering. For primary bibliographic entry see Field 04A. W73-06230

THE ROLE OF SENSITIVITY ANALYSIS IN HYDROLOGIC MODELING, Maryland Univ., College Park. Dept. of Civil En-R. H. McCuen. Journal of Hydrology, Vol 18, No 1, p 37-53, January 1973. 6 fig. 25 ref. Descriptors: "Mathematical models, "Calibra-tions, Optimization, Systems analysis, Parametric hydrology, Correlation analysis, Mathematical

Identifiers: *Sensitivity analysis (Modeling).

Identifiers: "Sensitivity analysis (Modeling).

Sensitivity is a measure of the effect of change in one factor on another factor. Sensitivity analysis is potentially useful in all phases of the modeling process: model formulation, model calibration and model verification. The sensitivity of model parameters should be recognized as a special case of the above general definition. Parametric sensitivity is a vital part of most optimization techniques. However, other facets of sensitivity med to be recognized. The time-dependent nature of sensitivity should be considered in the formulation of hydrologic models. A variety of simplified hydrologic models are used to demonstrate the potential of sensitivity in all phases of the modeling process. The failure to recognize and exploit the potential of sensitivity analysis results primarily from the inadequacy of the mathematical foundations of sensitivity. A comprehensive mathematical framework of sensitivity is provided and additional research needs are identified. (Kuapp-USGS) USGS) W73-06246

A DESCRIPTION OF THE EPI HYDRODYNAMICAL-NUMERICAL MODEL, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 02L. W73-06355

REPLY, (TO COMMENTS ON ANALYSIS OF STOCHASTIC HYDROLOGIC SYSTEMS), Illinois Univ., Urbana. Dept. of Civil Engineering. V. T. Chow, and S. J. Kareliotis. Water Resources Research, Vol 8, No 1, p 163-165, February, 1972. 10 ref. OWRR B-038-III (6).

Descriptors: *Hydrologic systems, *Stochastic processes, *Streamflow forecasting, Reviews, Model studies, Equations, Runoff, Water yield,

A reply is presented to comments made by critics on the paper 'Analysis of Stochastic Hydrologic Systems,' 1970, by Ven Te Chow and S. J. Kareliotis. The authors agree with the critics that most hydrologic methods involve a certain degree of approximation. The approximation of the residual stochastic processes are crude, but the proposed method may be useful in the preliminary study of water resources planning and development. Because all stochastic methods are built on statistical data, the proposed method cannot be used in the absence of streamflow data. The specific feature of the proposed method is the procedure that systematically screens out the physical characteristics (which are possibly identifiable by statistical analysis) from the raw data before submitting the latter to a purely probabilistic analysis. Like any new method, the proposed method has to be further evaluated and improved. (See also W71-03869) (Woodard-USGS) W73-06406

STOCHASTIC HYDRAULICS--A CHALLENG-ING FIELD OF STUDY, Illinois Univ., Urbanna. Dept. of Civil Engineer-

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Descriptors: *Hydrology, *Hydraulics, Hydrologic data, *Stochastic processes, Reviews, Evalua-tion, Mathematics, Probability, Statistical methods, Synthetic hydrology, Conferences. Identifiers: *International symposium, Stochastic hydraulics, Definitions.

SELECTED WATER RESOURCES ABSTRA

An introductory speech was given at the Interna-tional Symposium on Stochastic Hydraulics, Pitt-sburgh, Penn, May 31-June 2, 1971 to define stochastic hydraulics, and to indicate the need for a distinction between the words stochastic and probabilistic. The deterministic process and the probabilistic process are the two extreme cases of the stochastic process. Also included are dif-ferences in the stochastic nature of the problems dealt with in stochastic hydrology and stochastic hydraulics. The stochastic approach is recom-mended as a possible way to analyze complicated problems in hydraulics that cannot be understood otherwise by means of simple physical laws. (Woodard-USGS)

2B. Precipitation

PRECIPITATION ENHANCEMENT PROGRAM FOR ILLINOIS, Illinois State Water Survey, Urbana. Atmospheric

Ilmois State Water Survey, Orbana. Almospheric Sciences Section. S. A. Changnon, Jr. Meeting Preprint No. 1896, American Society of Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 18 p, 6 fig. 7 ref.

Descriptors: "Weather modification, "Precipita-tion (Atmospheric), "Precipitable water, "Cloud seeding, "Illinois, Water supply development, Water resources development, Rainfall, Artificial precipitation, Supplemental irrigation, Dry seasons, Crop roesponse, Crop protection.

reasons, Crop response, Crop protection.

The study of water resource problems for the state of Illinois has led to the study of precipitation enhancement programs. Although Illinois is generally regarded as a humid state, both long-term and short-term water resource development is necessary to rovoide increased quantities of high quality water needed. Long-term development is necessary to rovoide increased quantities of high quality water needed by the state in years to come. Short-term development would be helpful in increasing crop yields if the water were made available during the months of July and August in normal years. In order to study all the effects of such a program, a five year study was initiated in 1971 by the Bureau of Reclamation and the State of Illinois. Ten separate studies are being conducted including: (1) economic benefits, (2) ecological effects, (3) public information, (4) legal aspects, (5) cloud and storm sampling, (6) numerical modeling, (7) consideration of down-wind effects, (8) seeding technology, (9) rainwater chemistry measurements and (10) an integrated summary with emphasis on an enhancement experiment. At a cost of 5 cents to 20 cents per acre, crop increases amounting to one dollar, or more, per acre can be expected 80 percent of the time and \$5 or more a nacre 40 perto 20 cents per acre, crop increases amounting to one dollar, or more, per acre can be expected 80 percent of the time and \$5, or more, an acre 40 per-cent of the time. Downwind effects should be minimal, as the program would use only about 2 percent of the 2,000 billion gallons which passes over the state each day. (Poertner) W73-05937

HUMAN RESPONSE TO HURRICANE CELLA, Texas A and M Univ., College Station. Environ-mental Quality Program. For primary bibliographic entry see Field 06B. W73-06076

GEOMORPHIC MODEL WATERSHED CHARACTERISTICS AND PRECIPITATION VARIABLES, State Univ. of New York, Syracuse. Coll. of ary bibliographic entry see Field 02A.

DENDROCLIMATOLOGY AND DENDROECOLOGY,
Arizona Univ., Tucson. Lab. of Tree-Ring
Research. For primary bibliographic entry see Field 07B. W73-06373

BOMEX: AN APPRAISAL OF RESULTS, Washington Univ., Seattle. Dept. of Atmospheric Sciences. For primary bibliographic entry see Field 07C. W73-06386

OSCILLATION FREQUENCIES OF FREELY SUSPENDED WATER DROPS, State Univ. of New York, Albany. A. R. Nelson, and N. R. Gokhale. Journal of Geophysical Research, Vol 77, No 15, p 2724-2727, May 20, 1972. 2 fig, 1 tab, 10 ref. NSF Grant GA-839.

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Descriptors: "Rainfall, "Drops (Fluids), "Particle size, "Water, "Clouds, Frequency analysis, Theoretical analysis, Equations, Photography, Correlation analysis, Winds, Analytical techniques, Forecasting, Cloud physics, Precipitation (Atmospheric). Identifiers: "Water drops, Oscillation frequencies, Vertical wind tunnel.

An investigation of water-drop oscillations was undertaken through the analysis of high-speed films of water drops suspended in a large vertical wind tunnel. Measurements of the natural frequency of vibration of suspended water drops versus diameter were made for drops ranging in size from 1 to 7 mm. A theoretical formula derived by Lord Rayleigh in 1879 predicts that, for small spheroidal oscillations of a water drop, the frequency is proportional to the diameter raised to the -3/2 power. Although the drops in the present study were suspended at their terminal velocity and were significantly deformed, the data agree with both the power dependence and the coefficient of proportionality. (Woodard-USGS)

2C. Snow, Ice, and Frost

RIBBED GROOVES AND TRACKS IN MUD TIDAL FLATS OF COLD REGIONS, Centre de Recherches Forestiere des Laurentides, For primary bibliographic entry see Field 02J. W73-06170

FORMATION OF JOINTS IN BEDROCK BY MOVING GLACIAL ICE, Geological Survey, Albuquerque, N. Mex. F. W. Trainer. Journal of Research of the U.S. Geological Survey, Vol 1, No 2, p 229-235, March-April 1973. 2 fig. 1 tab, 21 ref.

Descriptors: "Joints (Geologic), "Fractures (Geologic), "Glaciation, Errosion, "Structural geology, Movement, Glacichydrology, Glaciers, Geomorphology, Degradation (Glacial).

To investigate the hypothesis that glaciation may open joints in bedwock, the orientation of joints in igneous and sedimentary rocks was measured at 21 localities in California, Maine, and New York. Two joint sets, thought to be extension joints, flank the direction of advance and are separated from it by about 10 deg; two sets, thought to be shear joints, flank the direction of advance by about 40 deg; and two sets, thought to be release joints, are about 70 to 80 deg from the direction of advance, or nearly perpendicular to the extension joints. An average of five joint sets, including three or four in this pattern, was found at each locality. The joints are believed to have been

opened, in response to stress applied by the moving ice, along preexisting zones of weakness
(potential regional joints) in the rock. Some new
joints may have formed where no such zone was
present near the position required for fracture
under the applied stress. Additional investigation
of the hypothesis is desirable because of its possible bearing on glacial erosion by quarrying, on interpretation of joint patterns in glaciated regions,
and on the nature of aquifers in glaciated bedrock.
(Kaapp-USGS)
W73-06224 ed, in response to stress applied by the mov-

MORAINE LITHOLOGY AND ITS RELATIONSHIP TO ROCKS OF A GLACIER BED
(LITOLOGICHESKIY SOSTAV MOREN I
YEGO ZAVISIMOST' OT POROD LEDNIKOVOGO LOZEIA),
Leningrad State Univ. (USSR).
Ye. V. Rukhina.
Litologiya i Poleznyye Iskopayemyye, No 1, p
137-142, January-February 1972. 6 ref.

Descriptors: *Glacial drift, *Glaciers, *Beds, Rocks, *Petrology, Petrography, Mineralogy, Particle size, Bedrock, Detritus. Identifiers: *USSR, Ice sheets, Erratics, Exara-tion, Paleogeography.

Investigation of the composition and structural properties of moraines is based on a report presented at the first seminar on continental sedimentation, organized by the Commission on Sedimentary Rocks in February 1970 in Moscow. A variety of depositional features associated with glaciers and ice aheets was examined, including ground moraines, glacial dislocations, and eratics. A study of moraine lithology will help to determine the composition of underlying bedrock, reconstruct the paleorelief, locate areas from which glacial material has been removed, establish the mode of transport of detritus, and define the conditions of its deposition. (Josefson-USGS) W73-06232

WATER EQUIVALENT OF SNOW SURVEYS USING NATURAL TERRAIN RADIATION, EG and G, Inc., Arlington, Va. For primary bibliographic entry see Field 07B. W73-06256

MIGRATION OF TRACE METALS IN SNOW, Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 05B. W73-06404

ICE AND SNOW IN EOLIAN SAND DUNES OF SOUTHWESTERN WYOMING, Wyoming Univ., Laramie. Dept. of Geology. J. R. Steidtmann. Science, Vol 179, No 4075, p 796-798, February 23, 1973. 2 fig. 9 ref.

Descriptors: *Ice, *Snow, *Aeolian soils, *Dune sands, *Wyoming, Preservation, Paleoclimatolo-gy, Sandstones. Identifiers: Laminae.

Snow becomes incorporated in colian sand dunes of southwestern Wyoming when snow cornices on dune crests begin to melt, slide down the lee slope, and are covered by sand during subsequent leeslide deposition. In some cases burial is rapid enough to provide the insulation necessary to preserve the ice and snow within the dune throughout the year. Deformed laminae associated with incorporated snow are preserved, and these features may be of value as paleoclimatic indicators in ancient sandstone. (Woodard-USGS)

OPEN CHANNELS IN SEA ICE (LEADS) AS ION

OFEN CHANNELS IN SEA ICE (LEADS) AS ION SOURCES, National Oceanic and Atmospheric Administration, Miami, Fla. Sea-Air Interaction Lab. W. D. Scott, and Z. Levin. Science, Vol 177, No 4047, p 425-426, August 4, 1972. 1 fig, 6 ref. ONR Grant N0014-67-A-0103-67-

Descriptors: "Sea ice, "Open channels, "Ice breakup, "Ions, "Atmosphere, "Alaska, Measure-ment, Aerosols, Bubbles, Gases, Froth flotation, Melting, Ice Melting, Ice. Identifiers: Ion sources, Atmospheric ions.

Identifiers: Ion sources, Atmospheric ions.

In 1970 an experiment was conducted at Point Barrow, Alaska, to measure the background aerosol in open channel sea ice (leads). The measurements were made at a time when the ice was starting to breakup offshore. The fluid in the leads was an ice slush composed of water and pieces of ice with no visible bubble activity. This observation suggests a mechanism of ion formation at the leads which is different from the mechanism of surf electrification, or is composed of a number of mechanism, some producing negative ions and some positive ones. Surf electrification originates from the bursting of bubbles at the sea surface and results in the production of a predominantly positive charge, the production of the excess negative ions may possibly be a result of the breakup of microbubbles and the release of gas either during the melting process or during the freezing of new water. Most significant, however, are the indications that the leads are acting as sources of atmospheric ions. (Woodard-USGS)

PLEISTOCENE PERMAFROST, WESTERN ARCTIC, CANADA,
British Columbia Univ., Vancouver. Dept. of Geography. J. R. Mackay, V. N. Rampton, and J. G. Fyles. Science, Vol 176, No 4041, p 1321-1323, June 23, 1972. 1 fig, 1 tab, 14 ref.

Descriptors: *Permafrost, *Frozen ground, *Glacial sediments, *Radioactive dating, *Arctic, Canada, Temperature, Frozen soils, Ice, Pleistocene epoch. Identifiers: Glacial deformation.

Permafrost, which was originally formed during the Pleistocene, is preserved in frozen sediments along the Arctic Coastal Plain of northwestern Canada. The area stretches 400 km from Herschel Island on the west to Nicholson Peninsula on the Canada. The area stretches 400 km from Herschel Island on the west to Nicholson Peninsula on the east. The Quaternary stratigraphy of the area shows the presence of widespread Pleistocene fluvial, lacustrine, and marine aediments that originated many years before on early glaciation; deposits and landforms attributed to two or more Laurentide glaciations; varied postglacial sediments chiefly of fluvial and lacustrine origin; and a complex of surface materials emplaced by periglacial processes. The Pleistocene sediments are now frozen to a considerable depth, as permafrost probably exceeds a thickness of 400 m in some localities. Cumulative radiocarbon and geomorphic evidence indicates that the Arctic Coastal Plain was not glaciated during the last 40,000 years. The glacially deformed beds and associated ground ice are probably much older than 40,000 years. It is evident that permafrost was present prior to glacier ice-thrusting and extended at least to the original depth of ice in the undisturbed sediments. (Woodard-USGS)

CHILEAN GLACIAL CHRONOLOGY 26,000 TO 11,000 CARBON-14 YEARS AGO: SOME GLOBAL COMPARISONS, Ohio State Univ., Columbus. Inst. of Polar Stu-

J. H. Mercer. Science, Vol 176, No 4039, p 1118-1120, June 9, 1972. 1 fig, 11 ref. NSF Grant GA-24422.

Descriptors: *Glaciology, *Radioactive dating, *Carbon radioisotopes, *South America, *Geomorphology, Glaciers, Ice, Glaciation, Regimen, Geology, Soil types, Correlation analysis, North America.

Identifiers: *Chile, New Zealand.

Chilean glaciers at a latitude of 41 deg S reached a maximum extent about 19,400 carbon-14 years before the present (B.P.), shrank 50 percent by 16,000 years B.P., and readvanced to a smaller maximum after 14,800 years B.P. These fluctuations were closely in step with those of the Lautions were closely in step with those of the Lautions were closely in step with those of the Lautions were closely in step with those of the Lautions were closely in step with those of the Lautions were closely in step with those of the Lautions were closely in step with those of the Lautions were sheet as the contract of the Mississippi River but differ somewhat from the accepted sequence in New Zealand. A corresponding pattern is not apparent in the Antarctic paleotemperature curve deduced from changes in oxygen isotope ratios. (Woodard-USGS)

2D. Evaporation and Transpiration

EVAPORATION FROM MORSE RESERVOIR, INDIANA, Geological Survey, Indianapolis, Ind. J. E. Heisel, R. E. Hoggatt, and C. H. Tate. Geological Survey Open-file Report, 1972. 33 p, 14 fig, 7 tab, 8 ref. EVAPORATION FROM MORSE RESERVOIR,

Descriptors: "Evaporation, "Reservoirs, "Indiana, "Energy budget, "Mass transfer, Data collections, Methodology, Correlation analysis, Meterology, Solar radiation, Temperature, Vapor pressure, in-Identifiers: *Morse Reservoir (Ind).

Identifiers: *Morse Reservoir (Ind).

Evaporation rates for Morse Reservoir, Indiana, were determined by the energy budget method, and a coefficient is defined for mass transfer evaporation rate evaluation. The evaporation rate also was determined using the energy budget with nearby solar radiation values and atmospheric radiation computed from an empirical relationship using air temperature and vapor pressure values. The results were similar, indicating that energy budget instrumentation requirements may be less than previously thought in some cases. Precision of streamflow measurements and the large volume of streamflow measurements and the large volume of other than the continuation of the water budget as a method to determine the evaporation rates. The average evaporation rate for the months studied was 0.318 centimeters per day using the energy budget method. To evaluate the coefficient, the evaporation rates were related to the mass transfer product. This includes the average wind velocity and the average difference between the saturation vapor pressure corresponding to the temperature of the water surface and the vapor pressure at some place where it has not been affected by passage over the water. (Woodard-USGS)

USE OF WATER BY SUGARCANE IN HAWAII MEASURED BY HYDRAULIC LYSIMETERS, Hawaii Univ., Honolulu. Water Resource Research Center. For primary bibliographic entry see Field 03F. W73-06258

ON THE EVAPORATION FROM A LAKE IN WARM AND DRY ENVIRONMENT, Bonn Univ. (West Germany). Inst. of Meteorology. K. Fraedrich. Tellus, Vol 24, No 2, p 116-121, 1972. 2 fig. 8 ref.

Descriptors: "Evaporation, "Reservoir evapora-tion, "Air circulation, "Thermal stratification, "In-

Field 02-WATER CYCLE

Group 2D—Evaporation and Transpiration

version, Air-water interfaces, Mathematical studies, Air, Humidity, Weather, Convection.

Evaporation suppressed by an inversion can occur over water reservoirs, when air is advected from a dry and warm environment. A proposed model of this process is based on the conservation of heat and moisture, and on the energy balance at the water surface. Under steady state conditions the inversion height, and the turbulent heat and water vapor fluxes are analytically determined. They depend on the travel distance of the air over the water surface, on simple turbulence parameters, on the net radiation at the water surface, and the temperature and moisture distribution over the land. An example is presented for the case of a well mixed environment. (Jerome-Vanderbilt) W73-06366

2E. Streamflow and Runoff

CHARACTERISTICS OF HYDROFOIL WEIRS, Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering. For primary bibliographic entry see Field 08B. W73-05958

INTERFACIAL WAVE BREAKING IN STRATIFIED LIQUIDS, State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W73-03960

COMPUTER PROGRAMMING FOR FLOW OVER SIDE WEIRS, SOUTHWARD Univ. (England). Dept. of Civil Engineering. For primary bibliographic entry see Field 08B.

DIFFERENCE METHOD FOR HIGHER-ORDER EQUATIONS OF FLOW, International Courses in Hydrology and Sanitary Engineering, Delft (Netherlands). Computational Hydrology Group. For primary bibliographic entry see Field 08B. W73-05963

SURFACE JET AT SMALL RICHARDSON NUMBERS, Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering. For primary bibliographic entry see Field 03B. W73-05966

SURFACE-WATER INVESTIGATIONS AT BAR-ROW, ALASKA, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 07C. W73-05971

TIME OF TRAVEL OF A DYE IN QUINNIPLAC RIVER, CONNECTICUT, Geological Survey, Hartford, Conn. For primary bibliographic entry see Field 05B. W73-05972

LOW-FLOW CHARACTERISTICS OF INDIANA STREAMS, Geological Survey, Indianapolis, Ind. P. B. Rohne, Jr. Geological Survey Open-file Report, 1972. 322 p, 3

Descriptors: *Streamflow, *Flow characteristics, *Low flow, *Indiana, Hydrologic data, *Basic data collections, Stream gages, Gaging stations,

Discharge measurement, Average flow, *Low-flow frequency.

Low-flow characteristics of streams are presented for data collected up to 1971 for nearly 300 sites in Indiana. Selected low-flow frequency and flow-duration values are given for all partial-record and short-term recording gage sites. For all long-term gaging stations, annual and summer (June-August) low-flow frequency tables are presented as well as duration tables for selected periods: 3 montha-June-August, 3 montha-August-October, 6 months-May-October, and 12 montha-October-September. The average discharge is presented for all full-time gaging stations having more than 6 years of record. (Woodard-USGS)

MAP SHOWING WATERCOURSES AND AREAS INUNDATED BY HISTORIC FLOODS IN THE MORRISON QUADRANGLE, JEFFERSON COUNTY, COLORADO, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 67C. W73-05978

REMOTE SENSING FOR EVALUATING FLOOD DAMAGE CONDITIONS—THE RAPID CITY, SOUTH DAKOTA FLOOD, JUNE 9, 1972, South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 07B.
W73-05984

TIDAL CORRECTIONS PROGRAM, Naval Oceanographic Office, Washington, D.C. For primary bibliographic entry see Field 07C. W73-05985

PREDICTING PEAK FLOW OF SMALL WATERSHEDS BY USE OF CHANNEL CHARACTERISTICS, Minnesota Univ., Minneapolis. Water Resources Research Center.
C. L. Larson, R. F. Gronwald, and A. G. Pennell. Available from National Technical Information Service as PB-216 807; 53.00 in paper copy, 50.95 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin S2, June 1972. 100 p, 19 fig, 5 tab, 19 ref. OWRR A-023-MINN (March 1975).

Descriptors: *Surface runoff, *Peak discharge, Watersheds (Basins), Rainfall-runoff relationships, Hydrographs, *Small watersheds. Identifiers: *Time parameter, *Travel time, Peak flow constitution.

In previous studies, a method was developed for predicting the effects of channel characteristics, including watershed size and shape on peak flow from small watersheds. The method was incomplete, however, since it lacked a working method of estimating the time parameter for ungaged watersheds. Therefore, the first objective of this study was to satisfy this need. The second objective was to test the overall method as a means of predicting peak flow for small ungaged watersheds, given the runoff volume. The overall method begins with a hydrologic analysis of numerous rainfall-runoff events observed at selected experimental watersheds. This yields certain hydrologic parameters which can be evaluated only for gaged watersheds. Then, the physical characteristics of these watersheds, primarily the channel characteristics, are utilized to evaluate the same parameters by use of an hydraulic or flow approach. If this can be accomplished successfully, the same procedure can be applied to ungaged watersheds. The following conclusions can be made based on the results of the study: A new time parameter, time to 50% of equilibrium, T50, was proposed. It can be evaluated hydrologi-

cally, i.e., from observed hydrographs in many but not all cases this is essential if it is to be used in peak flow predictions for other, ungaged watersheds. The combination of peak flow equation, the time parameter, T50, and the relationship of Cp, the peak flow coefficient, to the ratio D/T50, where D is the duration of rainfall excess, appears to provide a satisfactory but not highly accurate procedure for estimating peak runoff, given the volume of rainfall excess and its approximate time distribution. (See also W71-06121, W71-08664, and W71-00061) (Walton-Minnesota)

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HYDROLOGIC SIMULATION: NORTH BRANCH OF THE CHICAGO RIVER. Northeastern Illinois Planning Commission, Chicago.

February 15, 1972, 18 p, 9 append.

Descriptors: Hydrology, *Simulation analysis, *Flooding, Analytic techniques, *Computer models, *Mathematical models, Hydrologic systems, Computer programs, Urbanization, Forecasting, Flood control, Land use, Methodology, Water quality, Economics, Planning, *Illinois. Identifiers: *Hydrologic simulation, *Chicago River (III).

River (III).

A condensed presentation is made of the more relevant ideas, topics of agreement or controversy, and recommendations from a seminar organized by the Northern Illinois Planning Commission to evaluate the methodology and results of its hydrologic simulation study of the North Branch of the Chicago River. The purpose of that study was to develop a computerized program which would express in mathematical terms the past flooding experiences in the basin and be capable of forecasting similar happenings under conditions of future urbanization. In addition, the program was to be capable of use in evaluating the effects of proposed flood control or major land use projects within the basin. Among the recommendations were: a need to determine how best to apply the model, a need to consider economics and water quality aspects of the basin as well, and the need to obtain a planning staff which understood the applications and mechanisms of the model. (Davis-Chicago)

EDDY DIFFUSIVITY AND VELOCITY PROFILES FOR A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN CHANNEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 08B. W73-06098

THERMAL DISPERION IN A STREAM MODEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. S. F. Hsueh. M Sc Thesis, January 1972, 70 p, 16 fig, 7 tab, 36 ref, 3 append. OWRR-A-019-NJ (4).

Descriptors: Velocity, Turbulent flow, *Dispersion, Diffusivity, *Temperature, *Thermal pollution, Eddies, *Model studies, Path of pollutants.

Thermocouples were employed to observe temperature profiles in a stream model. At a slope of 0.0012, measurements were carried out at three different positions with dispersion rates at 1/20 and 1/40 of the main stream volumetric flow respectively. Dispersion patterns were examined through dye dispersion studies, and a heat budget was derived to describe the interfacial phenomena. W73-06099

VELOCITY PROFILES AND CHARAC-TERISTICS OF A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN CHANNEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. For primary bibliographic entry see Field 08B. W73-06100

TRAVEL TIME FOR SOLUTES, UPPER SABINE RIVER BASIN, TEXAS, APRIL 16-30, 1972,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-06174

SURFACE WATER MAP OF THE SALINA QUADRANGEL, UTAH, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-06176

ESTIMATING LOW-FLOW CHARACTERISTICS OF STREAMS IN SOUTHEASTERN MASSACHUSETTS FROM MAPS OF GROUND-WATER AVAILABILITY, Geological Survey, Boston, Mass. G. D. Tasker.
In: Geological Survey Professional Paper 800-D, p D217-D220, 1972. 3 fig, 2 tab, 5 ref.

Descriptors: *Surface-groundwater relationships, *Low flow, *Base flow, *Massachusetts, *Water yield, Hydrogeology, Groundwater, Surface waters.

Identifiers: *Water availability.

In southeastern Massachusetts the annual minimum 7-day mean flow at the 2- and 10-year recurrence intervals are significantly related, with a standard error of estimate of 50% and 70%, respectively, to the drainage area and the average groundwater available from wells in the basin. Although a geographical bias is evident, errors in estimates of low-flow characteristics based solely on drainage area can be significantly reduced by also considering the average groundwater available from wells in the basin. (Knapp-USGS) W73-05222

FLOW CHARACTERISTICS OF GEORGIA STREAMS, SUMMARIES OF FLOW DURA-TION AND OF LOW AND HIGH FLOWS AT GAGING STATIONS, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 07C. W73-46227

PROBLEMS OF RIVER BED DEFORMATION IN A CONFLUENCE ZONE, Institut 2a Vodoprivredu Jaroslav Cerni, Belgrade (Yugoslavia). For primary bibliographic entry see Field 02J. W73-06229

THE RATIONAL METHOD OF FLOOD ESTI-MATION FOR NEW SOUTH WALES, New South Wales Univ., Sydney (Australia). School of Civil Engineering. For primary bibliographic entry see Field 04A. W73-06230

RUNOFF PROCESSES AND SLOPE DEVELOP-MENT IN BADLANDS NATIONAL MONU-MENT, SOUTH DAKOTA, Vrije Universiteit, Amsterdam (Netherlands). Inst. of Earth Sciences. For primary bibliographic entry see Field 02J. W73-06245 CHANGES IN A BRAIDED REACH, Sheffield Univ. (England). Dept. of Geography For primary bibliographic entry see Field 02J. W73-06249

TEMPERATURE FLUCTUATIONS AT AN AIR-WATER INTERFACE CAUSED BY SURFACE WAVES,

Argonne National Lab., Ill. J. Whitting. Journal of Geophysical Research, Vol 77, No 18, p 3265-3269, June 20, 1972. 8 ref.

Descriptors: "Water waves, "Air-water interfaces, "Thermal properties, Wave action, Fluctuations, Water properties, Boundary layers, Laboratory tests, Equations, Mathematical studies. Identifiers: Radiometric observation.

The variation of surface temperature induced by a plane progressive irrotational linear water wave when a thermal boundary layer exists is predicted.

(1) When the wave period is sufficiently small (< about 3 sec), the amplitude of the wave-induced temperature fluctuation is proportional to the wave amplitude and to the square root of the wave period. This result is in perfect agreement with experiments that, however, are by no means definitive. (2) Surface temperature maximums lead wave crests by one-eighth of a period when the average surface temperature is less than the bulk water temperature; surface temperature minimums lead wave crests by one-eighth of a period when the average surface temperature exceeds that of the water below. (Jerome - Vanderbilt)

SURVEYS OVER THE HUNGARIAN REACH OF THE DANUBE AND THE RESULTS OF THE LATEST RIVER SURVEY (A DUNA MAGYARORSZAGI SZAKASZANAK FEL-MERESEI ES LEGUTOBBI FELMERESENEK EREDMENYEI),

L. Bendefy. Vizugyi Kozlemenyek, No 4, p 446-452, 1972. 11 ref. (English Summary)

Descriptors: *Surveys, *Data collections, *Rivers, *Hydrologic data, Channel morphology, Hydrography, Mapping.
Identifiers: *Danube River, *Hungary.

Surveys of the Danube River are reviewed. The first acceptable, formally correct map of the Danube was constructed between 1510 and 1520, while the first general map was made at the beginning of the 18th centry by army engineers. A hydrographic survey was made between 1773 and 1788 by the order of emperor Joseph II. The first survey in the modern sense was started by the Hungarian engineer M. Huszar, who drew 2,441 maps to 1:3600 scale. The next survey from 1890 to 1904 was completed by the Hungarian Hydrographic Institute. Since the beginning of the present century several detail surveys have been made. The latest comprehensive hydrographic survey was completed between 1968 and 1970 by the Hungarian Research Institute for Water Resources Development. The results were published in 8 volumes. The recent work includes a detailed list of bench marks, map to 1:10,000 scale, profiles to 1:20,000 and 1:5,000 scale, bridge cross-sections to 1:2,500 and 1:500 scale, and granulometric curves of bed-material samples. Information is presented in three supplementary volumes. A separate volume is devoted to the hydrological, hydrographic and hydromorphological data of the Danube. (Knapp-USGS)

2F. Groundwater

THE ROLE OF GROUND WATER IN THE NA-TIONAL WATER SITUATION, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 64B. W73-05904

THE QUALITY OF GROUND WATER IN RELA-TION TO IRRIGATION AGRICULTURE IN NORTHWESTERN NEW SOUTH WALES, AUS-TRALIA, University of New England, Armidale (Australia). For primary bibliographic entry see Field 03C. W73-05908

THEORY OF AQUIFER TESTS, Geological Survey, Washington, D.C. J. G. Ferris, D. B. Knowles, R. H. Brown, and R. W. Stallman. Water-Supply Paper 1536-E, 1962, 104 p, 29 fig, 6 tab, 70 ref.

Descriptors: *Aquifer testing, Groundwater, Groundwater movement, Hydraulics, Hydraulic models, Hydraulic properties, Theis equation, Darcy's law, *Theoretical analysis, Testing, Flow system, Elastic deformation, Storage coefficient. Identifiers: Nonequilibrium formulae, Sinusoidal fluctuations, Image-well theory.

fluctuations, Image-well theory.

An important milestone in ground water hydraulics was Theis' development in 1935 of a solution for the nonsteady flow of ground water, which enabled hydrologists for the first time to predict future changes in ground-water levels resulting from pumping or recharging of wells. Since then quantitive ground-water hydrology has been entarging to rapidly as to discourage the preparation of comprehensive textbooks. Developments in fluid mechanics that apply to ground-water hydrology are surveyed. Concepts and principles, and the delineation of limits of applicability of mathematical models for analysis of flow systems in the field are emphasized. The importance of the geologic variable and its role in governing the flow regimen is stressed. The origin, occurrence, and motion of underground water in relation to the development of terminology and analytic expressions for selected flow systems is discussed. The underlying assumptions necessary for mathematical treatment of these flow systems, with particular reference to the way in which the assumptions limit the validity of the treatment are described. (Campbell-NWWA)

SEA WATER INTRUSION, ARTIFICIAL RECHARGE, AND SURFACE WATER-GROUND WATER RELATIONSHIPS: A GENERAL STATEMENT, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Ground-water Hydrology. For primary bibliographic entry see Field 04B. W73-05926.

GROUND WATER IN SEDIMENTARY (CLASTIC) ROCKS, Alberta Research Council, Edmonton. J. Toth. In: Proceedings of the National Symposium on Ground-Water Hydrology, p 91-102, November 1967.6 fig. 19 ref.

Descriptors: "Groundwater, Groundwater potential, "Groundwater movement, Porous media, Porosity, Geologic units, Hydrology, Flow nets, Hydraulic models, Hydraulics, Theoretical analysis, "Model studies, "Sedimentary rocks, Zone of saturation. Identifiers: "Classic sediments, Lithology, Fluid potential.

Field 02-WATER CYCLE

Group 2F-Groundwater

The basic properties of the groundwater regime in sedimentary rocks are (1) Regional hydraulic continuity; and (2) Scale dependent appearance of the regime characteristics. These two basic properties are discussed in some detail. Two independent methods of approach, inductive and deductive, for establishing and demonstrating the existence of regional hydraulic continuity are given. The recognition of the principle of the scale dependent appearance of the groundwater regime is shown to be important both in realizing and evaluating the true significance of observed phenomena, and in extrapolating from one scale to another. The groundwater regime, overall, is shown to be a hydraulically continuous system. Regime properties are determined by the combined effects of the three components of the hydrogeologic environment: topography, geology, and climate. For a successful solution of problems of groundwater as a geologic agent or as the subsurface phase of the hydrogeologic cycle the regional and long term view must be adopted. This conclusion applies to all rock types, when fundamental properties of large-scale ground water regimes are considered. (Smith-NWWA) W73-05925

GROUNDWAYER RECOVERY, Technische Hogeschool, Delft (Netherlands). For primary bibliographic entry see Field 04B. W73-05933

DISPERSION IN NONUNIFORM SEEPAGE, Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering. B. W. Hunt. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY2, Paper 9553, p 295-299, February 1973. 7 ref, append.

Descriptors: *Dispersion, *Seepage, *Non-Uniform flow, *Groundwater movement, *Path of pollutants, Mixing, Mathematical models, Equa-tions, Numerical analysis.

General equations are derived which describe the dispersion of a pollutant in three-dimensional, nonuniform seepage. These equations are obtained by assuming that the principal directions of the dispersion tensor are tangential and normal to the streamlines, and the final result is shown to agree with the results of previous investigators only when the principal values of the dispersion tensor are written in a form which, in general, may not agree with experimental results. The advantages of using this model to compute aumerically the concentrations of a pollutant from piezometric head field data are pointed out. (Knapp-USGS)

ORTHONORMALIZATION APPLIED TO GROUND-WATER FLOWS, Wisconsin Univ., Kenosha. Dept. of Engineering

J. P. Zarling. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY2, Paper 9546, p 285-292, February 1973. 3 fig. 1 tab, 6 ref,

Descriptors: "Numerical analysis, "Groundwater movement, "Steady flow, Water wells, Water ta-ble, Equations, Artesian aquifers, Porous media, Water levels. Identifiers: "Orthonormalization.

The Gram-Schmidt orthonormalization procedure is a numerical method easily adaptable to digital computation of steady-state groundwater flow-problems. The advantages of this method are: (1) a series solution is attained, and (2) arbitrary shaped aquifers with arbitrary boundary conditions can be handled. The method is illustrated by application to a well flow problem in a confined aquifer. (K-napp-USGS)
W73-03957 W73-05957

IDENTIFICATION OF PARAMETERS IN FINITE LEAKY AQUIFER SYSTEM, California Univ., Los Angeles. Dept. of Engineer-

Camorina Carrier, and W. W.-G. Yeh.
M. A. Marine, and W. W.-G. Yeh.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 99, No HY2, Paper
9567, p 319-336, February 1973. 5 fig, 5 tab, 15 ref,
append. WRC Project W290.

Descriptors: "Artesian aquifers, "Finite element analysis, "Numerical analysis, Transmissivity, Storage coefficient, Parametric hydrology, Systems analysis, Aquifer characteristics, Groundwater movement, Leakage. Identifiers: "Leaky aquifers.

Many methods for analyzing leaky artesian systems are graphical procedures which involve inflection-point estimation and extrapolation of field data, or superposition and matching, or both, of field data to a family of theoretical curves. A systematic procedure for the identification of aquifer parameters in a finite leaky actesian system converts field observations directly to system parameters. The parameters to be identified are the transmissivity and storativity of the main aquifer, and the leakage factor of the system. The algorithm involves finite difference approximation and quasilinearization in conjunction with least-squares optimization. Examples that demonstrate the applicability of the algorithm are presented. (Knapp-USGS)

TRANSIENT FLOW TO FINITE WELL IN UN-CONFINED AQUIFER, California Univ., Los Angeles. School of En-gineering and Applied Science. For primary bibliographic entry see Field 04B. W73-05962

GROUND-WATER OCCURRENCE IN NORTHERN AND CENTRAL PARTS OF WESTERN COLORADO, Geological Survey, Denver, Colo. Geological Survey, Denver, Colo. For primary bibliographic entry see Field 04B. W73-05973

GROUNDWATERS OF THE HERETAUNGA PLAINS, HAWKE'S BAY. Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div. For primary bibliographic entry see Field 04B. W73-05974

GENERALIZED SUBSURFACE GEOLOGY OF THE WATER-BEARING DEPOSITS, NORTHERN SAN JOAQUIN VALLEY, CALFFORNIA, Geological Survey, Menlo Park, Calif. W. R. Hotchkiss. Geological Survey open-file report, May 12, 1972. 18 p, 6 fig. 55 ref.

Descriptors: *Hydrogeology, *Aquifer charac-teristics, *Groundwater resources, *California, Valleys, Geology, Well data, Petrology, Lithologic logs, Drilling, Water wells, Irrigation, Hydrologic data, Data collections. Identifiers: *San Josquin Valley (Calif).

About 5,000 square miles of the northern part of the San Joaquin Valley, California, is a broad structural trough drained by the San Joaquin River. Fresh groundwater is mostly in unconsolidated deposits derived from the Coast Ranges on the west and the Sierra Nevada on the east. The interfingering of Coast Range and Sierran alluvium, together with the variability and lenticularity of each, causes variation in the hydrologic properties both vertically and horizontally in San Joaquin Valley deposits. A persistent confining stratum, the Corcoran Clay Member of the Tulare Forma-

tion, can be correlated through most of the study area. Informally, the deposits above the clay are termed the upper unit; the clay is termed the confining clay stratum; and the deposits from the bottom of the clay to the base of fresh water are termed the lower unit. The upper unit is composed of beds, leases, and tongues of gravel, sand, and clay ranging in thickness from about 100 feet in the north to 500 feet at the south end of the study area. The lower unit is lithologically similar to the upper unit and ranges in thickness from 90 to more than 1,400 feet. (Woodard-USGS)

CONCENTRATION AND DISTRIBUTION OF ORGANIC SUBSTANCES IN GROUNDWATER URGANIC SUBSTANCES IN GROUNDWATER (SODERZEANIYE I RASPREDELENIYE OR-GANICHESKIKH VESHCHESTV V PODZEM-NYKH VODAKH), All-Union Scientific Research Inst. of Hydrogeology and Engineering Geology, Moscow (USSR).

For primary bibliographic entry see Field 05B. W73-05991

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, New Mexico Inst. of Mining and Technology, Secorro. Dept. of Geoscience.

For primary bibliographic entry see Field 02A. W73-06022

METHODS OF DETERMINING AQUIFER STORAGE CAPACITY AND FRESH-SALINE WATER INTERFACES BY GEOELECTRICAL INVESTIGATIONS, Missouri Water Resources Research Center, Rol-

For primary bibliographic entry see Field 04B. W73-06033

GROUND-WATER RESOURCES OF MERCER AND OLIVER COUNTIES, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. For primary bibliographic entry see Field 04B. W73-06182

MODELLING IN A KARSTIC BASIN-FRENCH JURA MOUNTAINS (MODELES JOURNALIERS D'ECOULEMENT DANS UN BASSIN KARSTIQUE-JURA FRANCAIS), Geneva Univ. (Switzerland). Dept. of Geology. R. Krummenacher, and E. Davaud. Journal of Hydrology, Vol 17, No 4, p 375-393, December 1972. 8 fig, 7 ref.

Descriptors: *Karst hydrology, *Water yield, *Mathematical models, *Hydrogeology, Karst Limestones, Markov processes, Recession curves, Evapotranspiration, Infiltration, Subsurface runoff, Water balance, Hydrologic budget. Identifiers: *Switzerland, *Jura Mountains.

The Valserine Karst basin is located in the Jura Mountains in Switzerland. The limestones are deeply karstified at higher elevations and are often buried under a thick organic soil. Two daily water balance models are proposed: one analytic, the other dynamic. Programs were written in FORTRAN IV for a CDC 3800 computer. The analytic model incorporates the groundwater recession curve. The recession curve is a function of the intensity of the previous flood and the paed time in days. The dynamic model assumes that the rain follows two different pathways. On the limestones, infiltration is almost instantaneous, and no evaportranspiration takes place. On the impervious formations there is both an increase of water saturation and direct runoff. Some of the runoff is lost by evaporation. Decrease or increase of the groundwater reserves as well as water saturation.

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ration are dependent on daily rainfall and tempera-ture and on the state of the basin on the previous day. The total groundwater reserves were esti-mated by this dynamic model and a good agree-ment between the observed and calculated discharges was demonstrated. (Knapp-USGS) W73-06182

ON THE ANCIENT WATER OF THE UPPER NUBIAN SANDSTONE AQUIFER IN CENTRAL SINAI AND SOUTHEEN ISRAEL, Geological Survey of Israel, Jerusalem. A. Issar, A. Bein, and A. Michaeli. Journal of Hydrology, Vol 17, No 4, p 353-374, December 1972. 5 fig, 3 tab, 28 ref.

Descriptors: "Groundwater resources, "Aquifers, "Hydrogeology, "Groundwater basins, "Groundwater mining, Water supply, Water yield, Sandstones, Recharge, Groundwater movement, Radioactive dating.

Health of the Common Sandstone.

Identifiers: "Israel, "Nubian Sandstone.

The Nubian Sandstone underlying the desert of Central Sinai and the Negev contains fresh water. The quantities stored in this aquifer are estimated at several hundred billion cubic meters. Although only a very small fraction of this water has pumpage potential, this aquifer is of economic importance. The present sarid climate of the area, the distances between the possible recharge areas and the areas where the water is found, as well as the large volume of water in storage, indicate that a large part of the water in this aquifer is fossil. The age of the water, based on the C-14 dating method, ranges from 13,000 years to more than 30,000 years. The OJD-18 ratios of this water are characteristic of precipitation in more temperate climates than the present one. Although the water outflowing today entered the aquifer more than 13,000 years ago, the rate of discharge is determined by the present rate of replenishment. Similar aquifers, containing fossil water in correlative stratigraphic sequences, are known in the Sahara and the Western Desert of Egypt. (Knapp-USGS) W73-06186

CONTRIBUTION TO THE FORMULATION OF THE THEORY OF GROUNDWATER FLOW THROUGH AN ELASTIC DEFORMABLE AQUIFER, Indiana Univ., Bloomington. Dept. of Geology.

J. Karanjac.

Journal of Hydrology, Vol 17, No 4, p 331-351,
December 1972. 2 fig, 22 ref.

Descriptors: "Groundwater movement, "Artesian aquifers, "Elastic deformation, "Elasticity (Mechanical), Fluid friction, Darcys law, Storage capacity, Storage coefficient, Pressure, Rock mechanics, Deformation, Porous media, Aquifer characteristics, Hydrogeology.

Identifiers: "Elastic aquifers.

The equation of motion (generalized Darcy's law) of a slightly compressible viscous liquid in an elastic porous medium was derived by means of the theory of interacting continua. The motion is expressed in terms of the macroscopic velocity of the fluid relative to the porous solid. The equation for the force due to interaction between the solids and the fluid was formulated. Only the tangential (frictional) portion of this force is important in describing the flow of groundwater through a confined aquifer. The tangential part of the interacting force contributes mostly to distortion of the solid, whereas the normal portion contributes mostly to the elastic volumetric deformation. Only the normal portion of the interacting force is important in defining the storage in an aquifer due to the deformation of the medium. The system of equations, composed of the equations of motion of each component, must be solved simultaneously because fluid pressure and aquifer dilatation are coupled. Uncoupling may be accomplished in several sim-Uncoupling may be accomplished in several sim-

plified cases. The specific storage may be defined only in the cases where a simple relationship between fluid pressure and dilastation exists. Since this relationship is not unique, there is no unique definition of the specific storage. A pressure disturbance travels through an elastic porous medium with a finite velocity. The more compressible the aquifer, the slower the change in pressure and the higher the time lag. (Knapp-USGS) W73-06187

'EXPLORATION FOR HIDDEN WATER,' BY MOHAMMAD KARAJI - THE OLDEST TEXT-BOOK ON HYDROLOGY, Pahlavi Univ., Shiraz (Iran). Dept. of Geology. M. Nadji, and R. Voigt. Groundwater, Vol 10, No 5, p 43-45, September-October, 1972. 2 ref.

Descriptors: *Groundwater, Groundwater move-ment, *Hydrology, Hydrologic systems, *Hydrologic cycle, Wells, Water quality, Phreatophytes, Deserts, *Arid climates. Identifiers: *Persia (Iran), Qanats, *Texts.

Reviewing a classical Persian book on ground-water problems of the 11th century, it is shown that (a) Groundwater hydrology developed absolu-tely independently of geology. (b) The Arabic-Per-sian scientists of that time knew about the hydrologic cycle and the existence of different types of water underground; and they knew that the quality of water depends on the character of the rocks through which groundwater flows. (c) Techniques of developing groundwater resources in the Middle East, i.e., the digging of wells and quants, were of such a high standard that they are still in use today. Generally, it can be stated that the oriental scientists of the Middle Ages knew the basic principles of hydrology. Thus they were far ahead of their contemporaries in Europe. (Smith-NWWA) NWWA) W73-06205

DISCRETE TIME STEPS IN DIGITAL COM-PUTER ANALYSIS OF AQUIFERS CONTAIN-ING PUMPED WELLS, Birmingham Univ. (England). Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 04B.
W73-06247

DEUTERIUM AS A TRACER OF REGIONAL GROUND-WATER FLOW, SOUTHERN GREAT BASIN, NEVADA AND CALIFORNIA, Geological Survey, Ariington, Va. I. J. Winograd, and I. Friedman. Geological Society of America Bulletin, Vol 83, No 12, p 3691-3708, December 1972. 4 fig. 3 tab, 54

Descriptors: "Hydrogeology, "Groundwater basins, "Nevada, "Tracers, "Deuterium, Ground-water movement, Recharge, Water yield, Water balance, Springs, Water resources, "Great Basin,

Major springs in eastern and south-central Nevada collectively discharge more than 215,000 acre-ft annually from Paleozoic carbonate rocks. In east-central Death Valley, California, an additional several thousand acre-feet is discharged annually from springs fed by Paleozoic carbonate strata. Major springs in both states are located along the margins of, or within, the intermontane valleys and have highly uniform discharge, temperature, and water quality. They constitute a major water resource for the future economic growth of east-ern and south-central Nevada and are the principal sources of water for the National Park Service and private facilities in the Furnace Creek area of Death Valley National Monument. Hydrogeologic studies of the southern Great Basin differ widely

in their conclusions about the origin of these springs. Deuterium data indicate that Ash Meadows springs are fed by a mixture of recharge derived from the Spring Mountains-Sheep Range uplands, 30 to 60 mi east of the springs, with underflow from Pahranagat Valley and vicinity, 90 mi northeast of the springs. Mass balance considerations suggest that the underflow amounts to about 33% of the spring discharge. Underflow to Ash Meadows from Pahrump Valley, a source area proposed in the literature, is not supported by the data. The Death Valley springs may be fed, in part, by water derived from Ash Meadows. The Muddy River springs may originate as precipitation on the Spring Mountains-Sheep Range area. The suggested sources for the Ash Meadows and Death Valley springs are in agreement with sources previously identified by hydrogeologic and hydrochemical studies of the region. (Knapp-USGS)

PRELIMINARY REPORT ON LAND-SURFACE SUBSIDENCE IN THE AREA OF BURNETT, SCOTT, AND CRYSTAL BAYS NEAR BAYTOWN, TEXAS, Geological Survey, Houston, Tex. For primary bibliographic entry see Field 04B. W73-0638.

OCCURRENCE OF SHALLOW SALTY GROUND WATER IN SELECTED AREAS OF WEST VIRGINIA, Federal Water Quality Administration, Wheeling, B. M. Wilmoth. Proceedings of the West Virginia Academy of Science 1970, Vol 42, p 202-208, 1971. 5 fig, 4 ref.

Descriptors: *Saline water intrusion, *Ground-water, *Aquifer characteristics, *West Virginia, Hydrogeology, Data collections, Water wells, Withdrawal, Drawdown, Groundwater movement, Water utilization, Geology, Artesian wells, Chemi-

Salt water migration into fresh groundwater aquifers in many places of the western half of West Virginia is already far advanced. Because of the wide distribution of salty groundwater and connate brine at various depths, it is difficult to determine how much of the contamination is natural and how much is the result of subsurface industrial. determine how much of the contamination is natural and how much is the result of subsurface industrial activities. Natural salt water springs in Kanawha County were used by the Indians and early pioneer settlers; however, the available historical information indicates no large-scale natural variations in salt content of groundwater during the period of record. Salt water can migrate into the rocks immediately below fresh water zones and still pose no problem for shallow water wells pumped at low rates. Records at several water well developments show large-scale increases in salt content from various industrial activities. Brine under natural artesian pressure flowed up an abandoned open borehole and contaminated a fresh water aquifer in Fayette County. Overdevelopment of fresh groundwater at Charleston, Kanawha County, excessively lowered water levels and artificially induced migration of salt water into fresh water zones. (Woodard-USGS)

THE CHARACTERISTICS AND MECHANISM OF POROUS DEEP AQUIFERS UNDER THE HUNGARIAN PLAINS (NAGYMELYSEGU POROZUS VIZTAROLO RENDSZEREINK JELLEMZOI ES MUKODESMODJA), K Korio. K. Korim.

Vizugyi Kozlemenyek, No 4, p 369-392, 1972. 7 fig. 2 tab, 21 ref. English summary.

Field 02-WATER CYCLE

Group 2F-Groundwater

Descriptors: *Groundwater mining, *Groundwater resources, *Groundwater availability, movement, Geothermal studies, Geochemistry, Water yield.

Identifiers: "Hungary.

In the Hungarian Basin, a considerable volume of water is stored at great depths in Tertiary formations. The water in these deep aquifers is partly fossil in character. No recharge reaches these quifers and any withdrawal results in a diminution of supplies. The flow of water at these great depths is influenced greatly by the physical and chemical properties of the water itself. Because of the depth, the high geothermic gradient in the Hungarian Basin, and the dissolved gas content, a considerable quantity of natural energy has been stored. The energy content of dissolved gases (CH, CO2 and N2) is most important, whereas the elastic expansion of the compressed water and rock masses is of minor significance. The methods used for exploration involve basic observations in water wells (formation pressure, formation temperature, capacity, flow measurement and physical-chemical water analyses) and special studies of reservoir mechanics, such as interference between wells, well recovery, and calculation of recoverable water resources. Detailed reservoir-engineering investigations have been completed in southeast Hungary, in the regions of Szeged and Szentes. (Knapp-USGS)

REPORT ON GROUNDWATER, Geological Survey, Washington, D.C. A. I. Johnson. Hydrological Sciences Bulletin, International As-sociation of Hydrological Sciences, Vol 17, No 1, p 44-51, April, 1972. 211 ref.

Descriptors: *Groundwater resources, *Publica-tions, *Bibliographies, *International commis-sions, Water resources development, Water yield, Water quality, Groundwater recharge, Water quality, Groundwith Hydrogeology, Water utilization.

Hydrogeology, water unization.

During the period 1967-70, investigations of principles and processes in the field of groundwater made important progress. Groundwater research and data-collection programs have increased in number at an exponential rate as groundwater has become an increasingly more important part of the total water resource. The increasing number, complexity, and importance of water-management problems have resulted in the continuous development of data-collection and water-management techniques and in the growth of fundamental knowledge related to quantity and quality of groundwater. All this activity has produced an accelerating awareness of, and interest in, groundwater as an important natural resource in many parts of the world. As a result, many International Association of Scientific Hydrology (IASH)-sponsored meeting sessions and symposia have emphasized some phase of groundwater science. Association of Scientific Physiology (IASH)-spon-sored meeting sessions and symposis have emphasized some phase of groundwater science. (Woodard-USGS) W73-06407

HYDROLOGICAL AND ECTROBLEMS OF KARST REGIONS, Geological Survey, Raleigh, N.C. **ECOLOGICAL** H. E. LeGrand. Science, Vol 179, No 4076, p 859-864, March 2, 1973. 3 fig, 4 ref.

*Karst hydrology, Descriptors: "Karst, "Karst hydrology, "Geomorphology, "Ecology, Environmental ef-fects, Ecosystems, Surface-groundwater relation-ships, Rainfall-runoff relationships.

The relationships of hydrology to the ecology in limestone regions that have been altered by processes of karstification are discussed. Development of karst features depends greatly on the degree to which water containing carbon dioxide

has been able to move on and through carbonate rocks and to remove some of the rock in solution. Distinctive features of many karst terranes include scarcity of soils, scarcity of surface streams, and rugged topography. High permeability gives rise to many practical problems, including scarcity and poor predictability of groundwater supplies, scarcity of surface streams, instability of the ground, leakage of surface reservoirs, and an unreliable waste-disposal environment. Natural karst processes in some carbonate rock regions have caused a greater restriction in the development of biots than man can ever cause. (Knapp-USGS)

GEOTHERMAL ENERGY: AN EMERGING MAJOR RESOURCE, For primary bibliographic entry see Field 06D. W73-06413

2G. Water in Soils

AN EXPERIMENT ON THE EFFECT OF POND SOIL ON CALCIUM IN POND WATER, Alabama Agricultural Experiment Station, Au-

For primary bibliographic entry see Field 05B. W73-05870

THE RELATION OF PETROPABIRICS WITH DIRECTIONAL ORIENTATION OF MINERAL GRAINS FROM SOIL PARENT MATERIALS. AN EXAMPLE FROM NORWAY, Oslo Univ. (Norway). For primary bibliographic entry see Field 02J. W73-05967

PHYSICO-CHEMICAL FACTORS IN EROSION OF COHESIVE SOILS, California Univ., Davis, Dept. of Civil Engineer-

For primary bibliographic entry see Field 02J. W73-05996

CALCULATED WATER BALANCE AND SOIL HUMIDITY, (IN SPANISH), Inter-American Inst. of Agricultural Sciences, Turrialba (Costa Rica), J. Benavides, and J. M. Sainz.

J. Benavues, and J. M. Sain. A Agron Trop (Maracay). Vol 21, No 4, p 295-298, 1971, Ilus, English summary. Identifiers: "Water balance, "Soil moisture, Mathematical studies, Soil physical properties.

The water balance was calculated with the use of an accurate formula for potential evapotranspiration, the direct determination of the physical constants of the soil and the daily calculation of the water balance. There were no significant differences between calculated and observed humidity values.—Copyright 1972, Biological Abstracts,

RAPID REACTION RATES BETWEEN WATER AND CALCAREOUS CLAY AS OBSERVED BY SPECIFIC-ION ELECTRODES, Geological Survey, Lubbock, Tex. For primary bibliographic entry see Field 02K. W73-06225

VOLATILITY OF DDT AND RELATED COM-POUNDS, Agricultural Research Service, Riverside, Calif. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05A. W73-06299 EXPERIMENTAL INFORMATION ON HEXACHLOROCYCLOHEXANE PENETRATION INTO THE SOIL, (IN RUSSIAN), Institute of General and Municipal Hygiene, Moscow (USSR).

Por primary bibliographic entry see Field 05B.

W73-06325

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WATER PENETRATION OF VINEYARD SOILS AS MODIFIED BY CULTURAL PRACTICES, California Univ., Parlier. San Joaquin Valley Agricultural Research and Extension Center. F. K. Aljibury, and L. P. Christensen. Am J Enol Vitic. Vol 23, No 1, p 35-38. 1972. Identifiens: "Soil treatment, "Soil management, Erosion control, Soil erosion, Hydration, Irrigation, Soils, Vineyards, Cultivation, "San Joaquin Valley (Cal).

Valley (Cal).

Extensive acreage of vineyard soils in the San Joaquin Valley appears to have poor and unstable structure which deteriorates upon contact with water. Water may cause deterioration of these agregates in 2 ways: (1) hydration which disperses the soil structure through swelling; and (2) physical breakdown of the aggregates due to the erosive action of the moving water. The dispersed particles are carried into the upper soil pores and precipitate on the surface as a crust. Use of high electrolyte irrigation water and addition of gypsum to the soil increased the rate of water penetration. Aside from that, rate of water penetration was in direct proportion to the degree of soil crust prevention. A cover crop and organic matter added to the soils improved the rate of water. Penetration as long as a crust did not dominate. Penetration appeared to improve when the soil crust was disturbed by mechanical means.—Copyright 1972, Biological Abstracts, Inc. W73-06339

PALLMANN METHOD FOR MASS SAMPLING OF SOIL, WATER, OR AIR TEMPERATURES, Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics. For primary bibliographic entry see Field 07B. W73-06374

LAYERS OF HIGH THERMAL CONDUCTIVI-TY IN THE NORTH ATLANTIC,
Massachusetts Inst. of Tech., Cambridge. Dept. of
Earth and Planetary Sciences.
P. W. Kasameyer, R. P. Von Herzen, and G.

Journal of Geophysical Research, Vol 77, No 17, p 3162-3167, June 10, 1972. 5 fig, 11 ref. CO241-9, NONR 1841 (74).

This study which took thermal-conductivity values for 21 core samples from the ocean floor in the North Atlantic, was part of a continuing study of the thermal conductivity of oceanic sediments. These samples were taken from an area, between latitudes 42 deg. and 46 deg. North, which was divided by a central rift. The eastern and central sections of the sample area had typical conductivity values, while the western section varied from 2.0 4.33 mcal/cm. sec degree C. These high thermal-conductivity layers were composed of quartz sands and had an abnormally low moisture content. The layers are thick enough to affect the measured temperature gradients; thus many thermal-conductivity measurements must be made to obtain an accurate heat-flow measurement in the area. Future heat flow studies in that test area should use the needle-probe method in measurement of conductivity. (Jerome - Vanderbilt) W73-06377 This study which took thermal-conductivity val

SOILS OF THE TASERSIAQ AREA, GREEN-SOLLS OF THE LASEASING COMMITTEE AND COMMITT

terreenand, "Dramage, Bogs, Tundra soils.

Ten soil series are recognized for the ice-free area of Tasersiaq, Greenland. A profile description and pertinent chemical and physical data are presented for each series. For the most part the soils have developed in sandy till and kame terrace deposits under drainage conditions ranging from standing water to those which can be termed excessively well drained. It is believed that the soils of the Tasersiag area represent only a few thousand years of development under a climate to the present. The combination of factors of rapid internal drainage, relative site stability and healthy vegetation, have under present climatic conditions allowed the zonal process of podozilzation to be weakly expressed. Where internal drainage is partly or completely restricted and site instability occurs, a series of half-bog and tundra soils have developed.—Copyright 1972, Biological Abstracts, Inc. W73-06471

HYDROGEOLOGY OF DRY CRUST IN FIN-LAND, (IN FINNISH),

LAND, (IN PARCELES,)
J. Soveri.
Geologi (Helsinki). Vol 23, No 7, p 87-91. 1971.
English summary.
Identifiers: Binding, "Dry, Crust (Soils), "Finland,
Hydrogeology, Redox, "Soil binding intensity.

The binding intensity of the soil water was studied primarily with pressing, pF- and dehydration experiments. The influence of the geologic age of the sediment on the binding intensity of the soil water was most prononced at circumstances close to the field capacity, which may be ascribed to a slow weathering in the upper layers where air and water both occur in the interstices. Redox reactions cause the water molecules to adhere more securely to the polyionic surfaces of the vermicultic weathering products.—Copyright 1972, Biological Abstracts, Inc.

W73-06490

2H. Lakes

THE DEEPWATER SCULPIN, MYOXOCEPHA-LUS QUADRICORNIS THOMPSONI, NEW TO ALBERTA, CANADA, National Museum of Natural Sciences, Ottawa (Onsairo), D.E. McAllister, and J. C. Ward. Journal of the Fisheries Research Board of Canada, Vol 29, No 3, p 344-345, 1972. 10 ref.

Descriptors: *Sculpins, *Ecological distribution, Aquatic animals, Freshwater fish, *Canada, Animal morphology, Spatial distribution, Distribution patterns.
Identifiers: *Myoxocephalus quadricornis thomp-soni, *Waterton Lake.

Two specimens of Myoxocephalus quadricornis thompsoni were caught in Upper Waterton Lake, Waterton National Park, southwestern Alberta, by K. Globe in August, 1966. Characters of the two specimens, 27 and 48 mm in standard leagth, follow. The four preopercular spines with the uppermost 2.2 and 4 percent of the standard length (respectively, for the small and large specimens), the presence of a gap between the dorsal fins, and the gill membranes forming a fold across the isthmus, identify the specimens as the deepwater caulpin. The papillae on the top of the head behind the eyes were large and numerous and the pigment was slightly darker, thus resembling specimens on hand from Keller Lake, N.W.T., rather than those from Quebec, Ontario, and Michigan. Aside from

this, no prominent differences were noted between the Waterton specimens and other popu-lations. These specimens provide the first record for Alberta and extend the known range over 450 miles to the southwest. (Holoman-Battelle) W73-05998

DISTRIBUTION AND MIGRATION OF PERIDINUM IN LAKE KINNERET, Kinneret Limnological Lab., Tiberias (Israel). For primary bibliographic entry see Field 05C. W73-06003

A THERMAL FLUID-MECHANICAL MODEL FOR ESTIMATION OF POWER PLANT IM-PACT ON A STRATIFIED LAKE, Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 05B. W73-06023

THE ECOLOGIC IMPACT OF THE INTERAC-TIONS AMONG MICROORGANISMS AND AQUATIC CONTAMINANTS IN LAKE ERIE PHASE III, PARTS 5, 6, AND 7, Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 05C.

DISTRIBUTION OF FISHES AND ENVIRON-

MENTAL CONDITION IN ARTIFICIAL LAKES OF THAILAND (IN JAPANESE), Freshwater Fisheries Research Lab., Tokyo Presawater Fishenes Research Lab., Tokyo (Japan).
Y. Shiraishi, and S. Kimura.
Bull Freshwater Fish Res Lab Tokyo. Vol 21, No 1, 947-81, 1971. Illus. English sunamary.
Identifiers: Anabaena, *Artificial lakes, Distribution, Environmental conditions, Fishes, Lakes, Microcystis, Plankton, *Thailand, *Thermocline, Zooplankton.

Ubolratana, Bhumibol and Lam Pao reservoirs in Ubolratana, Bhumibol and Lam Pao reservoirs in Thailand were surveyed from July 6-14, 1969, to study the environmental characteristics and the distribution of fishes in the reservoir constructed in a tropical area. Thermoclines were observed between 11 and 13 m, 12 and 16 m and around 6 m in Ubolratana, Bhumibol and Lam Pao reservoirs, respectively. Chemical stratifications similar to thermal stratifications were also observed. No fish were detected in the hypolimpion, and the laws in were detected in the hypolimnion, and the layer in which fish live was narrow. Fish in the Ubolratana Reservoir disperse and come up to the surface in the evening. Vertica! distribution of electric con-ductivity in Bhumibol Reservoir of Mac Nam Chao Phraya drainage was apparently different from the other reservoirs of Mekong drainage. Plankton, especially zooplankton, was scanty. Microcystis and Anabaena were dominant.—Copyright 1972, Biological Abstracts, Inc. W73-06089

AND INTERDISCIPLINARY RESEARCH - PROBLEMS OF INITIATION, CONTROL, INTEGRATION, AND REWARD, California Univ., Davis. Dept. of Sociology; and California Univ., Davis. Div. of Environmental ary bibliographic entry see Field 06B.

EFFECTS OF IMPOUNDMENT ON THE WATER QUALITY OF THE BIGHORN RIVER, Montana State Univ., Bozeman. Dept. of Botany and Microbiology.

For primary bibliographic entry see Field 05B.

FREMONT LAKE, WYOMING--PRELIMINARY SURVEY OF A LARGE MOUNTAIN LAKE, Geological Survey, Washington, D.C. D. A. Rickert, and L. B. Leopold. In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D173-D188, 1972. 7 fig. 14 tab, 41 ref.

Descriptors: "Limaology, "Wyoming, "Water quality, Dissolved solids, Thermal stratification, Lakes, Alpine, Glaciation, Oligotrophy, Thermocline, Water chemistry, Water temperature, Dissolved oxygen.

[dentifiers: "Fremont Lake (Wyo).

Identifiers: *Fremont Lake (Wyo).

Freemont Lake, Wyoming, is at an altitude of 2,261 m, and has an area of 20.61 sg km and a volume of 1.69 cu km. The maximum depth si 185 m, which makes it the seventh deepest natural lake in the conterminous United States. Theoretical renewal time is 11.1 years. In 1971 vernal circulation extended to a depth of less than 90 m. The dissolved-oxygen curve is orthograde, with a slight metalimnetic maximum, and a tendency loward decreasing concentrations at depth. At 180 m, oxygen was at 80 percent of saturation in late July 1970. The lake has a remarkably low dissolved-solids content of 12.8 mg/l, making it one of the most dilute medium-sized lakes in the world. Detailed chemical data are given for the water column at three sites in the lake and for the influent and effluent streams. Net plankton included representatives of seven genera of phytoplankters and three genera of zooplankters. A reconnaissance indicated substantially no bacteriological contamination in the lake, but there was an appreciable amount in two minor streams in the vicinity of a summer-home colony. (Knapp-USGS) W73-06216 W73-06216

THE HYDROLOGIC BALANCE OF LAKE SAL-THE HYDROUGHE BALANCE OF LAKE SAL-LEE, BECKER COUNTY, MINNESOTA, Geological Survey, St Paul, Minn. W. B. Mann, IV, and M. S. McBride. In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D189-D191, 1972. 1 fig, 1 tab, 9 ref.

Descriptors: "Water balance, "Hydrologic budget, *Lakes, "Minnesota, Limnology, Evaporation, Base flow, Runoff, Rainfall-runoff relationships, Water levels, Water level fluctuations, Flow nets. Identifiers: "Lake Sallie (Minn).

Identifiers: *Lake Sallie (Minn).

The hydrologic balance of Lake Sallie, Minnesota, was determined for the 1969 and 1970 water years. In the 1969 water year, surface-water flow accounted for 77% of the inflow, precipitation 10%, and groundwater flow 13%; 86% of the outflow was surface water and 14% evaporation. The 1970 water year was comparable with 1969; groundwater year was comparable with 1969; ground-ace inflow and outflow were orrespondingly less. To check the groundwater flows computed in the hydrologic balance, flow nets were constructed. The goundwater inflows determined using the flow nets were 1,730 acre-feet during a period of low groundwater levels and 1,180 acre-feet during a period of high groundwater levels. The estimated range of error for elements of the water balance is: surface-water inflow and outflow, precipitation, and change in lake storage, plus or minus 3%; evaporation, plus or minus 10%. The estimated range of error for the groundwater inflow as determined from the flow-net analysis is plus or minus 30%. (Knapp-USGS)

AERIAL PHOTOGRAPHY OF WIND STREAKS ON ONEIDA LAKE, NEW YORK, Geological Survey, Albany, N.Y. J. M. Whipple, and P. E. Greeson.

Group 2H-Lakes

In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D193-D197, 1972. 3 fig. 1 tab, 11 ref.

Descriptors: *Lakes, *New York, *Water circulation, *Aerial photography, *Waves (Water), Currents (Water), Eddies, Vortices, Limnology, Remote sensing, Surveys, Mapping. Identifiers: *Wind streaks (Lakes), *Oneida Lake (N Y).

Extensive wind streaks are visible on vertical aerial black-and-white photographs of Oneida Lake, N. Y., October 25, 1967. Development and orientation of streaks appear to be related to wind direction, fetch, and bottom topography. Massive streaks are separated by less well defined streaks, and streak directions change by parallel offsets of abort segments. Streak spacing can be measured directly on vertical aerial photographs more effectively than at the water surface, and streak intensities can be discerned. The formation of wind streaks can be observed through use of repeated photography. (Knapp-USGS) W73-06218

TEMPERATURE FLUCTUATIONS WITHIN EN-GLISH LOWLAND PONDS, Leicester Univ. (England). Dept. of Zoology. N. A. Martin. Hydrobiologia, Vol 40, No 4, p 455-470, December 15, 1972. 8 fig. 5 tab, 11 ref.

Descriptors: *Water temperature, *Ponds, *Thermal stratification, Data collections, Foreign countries, Diurnal, Seasonal, Thermoperiodism, Aquatic life, Thermocline, Epilimaion, Hypolimaion, Limnology. Identifiers: *Leicestershire (England).

Identifiers: *Leicestershire (England).

Continuous water temperature measurements were made for almost 2 years in poods in Leicestershire, England. The number of degree-hours and the weekly and monthly mean temperatures were calculated. The water temperature in the ponds and the factors influencing the temperatures were very different in the winter and summer. In the winter the water temperature was fairly uniform, only fluctuating slightly, and was fairly uniform, only fluctuating slightly, and was influenced mainly by the air temperature. In the summer the water temperature was very variable and was mainly influenced by the amount of sunshine received. The range of temperature fluctuation and rate of change within a pond varied inversely with the depth of water, water cloudiness and the amount of plant growth. Maximum temperatures of 25-32 deg C were recorded during the day in very shallow water (0-3 cm deep). In slightly deeper water (10-15 cm deep) and in the surface layers to a depth of 10 cm over water 60 cm deep, maximum temperatures of 20-26 deg C were recorded. The minimum temperature recorded at night in very shallow water was rarely less than 10 deg C. (Woodard-USGS)

HYDROGEOCHEMISTRY OF THE SIVASH SALT MARSHES AND PEREKOP LAKES (O GIDROGEOKHIMII SIVASHA I PEREKOP-SKIKH OZER), S. V. Al'bov.

Litologiya i Poleznyye Iskopayemyye, No 1, p 83-87, January-February 1972. 1 tab, 5 ref.

Descriptors: "Water chemistry, "Geochemistry, "Chemical analysis, "Salt marshes, "Lakes, Water types, Brines, Springs, Trace elements, Inorganic compounds, Salts, Carbonates, Metals, Mineralogy, Silts, Fractures (Geologic), Drill holes. Identifiers: "USSR, "Crimea, "Sivash, "Perekop Isthmus, "Hydrogeochemistry, Rubidium, Antimony, Mineralization, Tectonics.

The composition of water in the Sivash salt marshes and Perekop lakes in northern Crimea was investigated for occurrence of F, Li, Sr, Rb, B, As, Sb, and Hg. The brine concentration in northeast Sivash is 38-7%, that in the southeast 2%-14%, and that in the west 23%-26%. The main constituents comprising these brines are NaCl, MgCl2, MgSO4, MgB72, KCl, CaSO4, and Ca (H-CO3)2. Chlorides of Na, Mg, and Ca are predominant in most waters of the Perekop lakes, with CaCl2 amounting to as much as 9% of the total. Sivash brines contain 4-7 mg/liter of fluorine, 16-40 mg/liter of strontium, up to 1 mg/liter of rubidium, 120-130 mg/liter of boron, and up to 0.035 mg/liter of arsenic. Brines of the Perekop lakes contain up to 4 mg/liter of fluorine, 52-295 mg/liter of strontium, and up to 1 mg/liter of rubidium, 173.5 mg/liter of boron, and 0.004 mg/liter of arsenic, respectively. Sivash silts contain 0.12%-0.16% strontium, 0.007%-0.009% boron, 0.006%-0.0078 mercury. Silts of the Perekop lakes contain 0.07%-0.41% strontium, 0.001%-0.005% antimony, and 0.001%-0.006% mercury. The formation of metals in brines and silts of the area may be associated with ascending springs and abyssal fractures. (Josefson-USGS)

SCHIZOMERIS - A GROWTH FORM OF STIGEOCLONIUM TENUE (CHLOROPHYTA: CHAETOPHORACEAE), Massey Univ., Palmerston North (New Zealand). Dept. of Botany. For primary bibliographic entry see Field 05C. W73-06224

POLYMORPHISM IN THE DESMID MICRASTERIAS LATICEPS AND ITS TAX-ONOMICAL IMPLICATIONS, Instituto de Botanica, Sao Paulo (Brazil). Phycology Section. For primary bibliographic entry see Field 05C. W73-06287

AN EVALUATION OF CERTAIN INDICES OF EUTROPHY AND MATURITY IN LAKES, Miami Univ., Oxford, Ohio. Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-06318

THERMAL STRATIFICATION AND ANNUAL HEAT BUDGET OF A FLORIDA SINKHOLE LAKE, Florida Univ., Gainesville. Dept. of Zoology. For primary bibliographic entry see Field 03C. W73-06324

EFFECTS OF SIZE-SELECTIVE PREDATION AND FOOD COMPETITION ON HIGH AL-TITUDE ZOOPLANKTON COMMUNITIES, Princeton Univ., N.J. Dept. of Biology. For primary bibliographic entry see Field 05C. W73-06331

SOME CHEMICAL AND PHYSICAL RELA-TIONSHIPS ON LAKE ONTARIO, Ontario Water Resources Commission, Toronto. For primary bibliographic entry see Field 05C. W73-06338

DISTRIBUTION OF PHYTOPLANKTON DUR-ING THE EARLY DEVELOPMENT OF VOLTA LAKE (1964-1968), Ghana Univ., Legon. For primary bibliographic entry see Field 05C. W73-06346 THE ORIGIN OF HOUSES IN THE OKEFENOKEE PRAIRIES, Okefenokee National Wildlife Refuge, Waycross, Ga.

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Ga. E. Cypert. Am Midland Nat. Vol 87, No 2; p 448-458. 1972. Illas.

Identifiers: Floating masses, *Okefenokee swamp, *Peat, Trees, *Georgia.

swamp, "Pest, Trees, "Georgia.

About 15% of the 412,000-acre Okefenokee Swamp is open marsh dotted with various-sized clumps of trees and shrubs known locally as 'houses.' These houses originate from partially floating masses of peat which are called 'batteries.' Batteries are of 3 types. In one type a mass of peat breaks loose from the underlying peat bed and floats freely on the water surface. A second type is that in which an upper layer of peat partially separates from the peat bed and forms a bulge above the water surface. A third type results from bits of loose floating peat and other debris drifting to the edge of a pond or a lake and accumulating until a base forms for the growth of vegetation. The upper surface of these batteries, being at or slightly above the water surface, provides habitat for a greater variety and more profuse growth of plants than does the open marsh. Ultimately woody growth encroaches, thus forming the clumps of trees known as houses.—Copyright 1972, Biological Abstracts, Inc. W73-06383

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES: L LAKE ROTOITI,

Auckland Univ. (New Zealand). Dept. of Botany. V. J. Chapman, J. M. A. Brown, F. L. Dromgoole, and B. T. Coffey.

and B. T. Coffey. N Z J Mar Freshwater Res. Vol 5, No 2, p 259-279. 1971.

Identifiers: *Lake Rotoiti (New Zealand), *Aquatic plants, Algae, Plant communities, Cyanophytes, Elodea canadensis M, Lagarosiphon major M, Lake, Lakes, New Zealand, Nitella hookeri, Plants, Sand, Silt, Springs.

Five plant communities in Lake Rotoiti, North Island, New Zealand (38 deg 02 min S, 176 deg 24 min E) are described. In shallow water (0-2 m depth) partly protected from the prevailing westerly winds, some indigenous species form characteristic mounds. From 2 to 6 m depth the exotic macrophyte Lagarosiphon major (Ridley) Moss is the dominant and forms dease beds which appear to have completely replaced any native vegetation. Elodea canadensis Michx., a longerestablished exotic, may form a minor component of this zone, but may become the dominant species in water above and below the Lagarosiphon zone. Lagarosiphon appears to be primarily restricted to silty sand, but on pure silt areas it is replaced by Elodea or Nitella hookeri A. Braun or both species. These zonations are probably static rather than successional. On underwater cliff faces and boulder shores, a seasonal succession of algae was the major vegetation. Only filamentous cyanophytes grew within 1-2 m of geothermal springs in the Lake.—Copyright 1972, Biological Abstracts, Inc.

W73-06489

ENVIRONMENTAL CONCERN AT LAKE TAHOE, A STUDY OF ELITE PERCEPTIONS, BACKCROUNDS, AND ATTITUDES, California Univ., Davis. For primary bibliographic entry see Field 05G. W73-06498

2I. Water in Plants

NEW INFORMATION ON THE FAUNA OF FRESHWATER OLIGOCHAETE OF LATVIA, Akademiya Nauk Latviiskoi SSR, Riga. Inst. of

O. L. Kachalova, and E. A. Parele. Latv Psr Zinai Akad Vestis. 1. p 27-32. 1972. Illus.

Latv Ta Zinai Asan Vessos. 1, 927-52, 11032. English summary. Identifiers: Aukofrilus limnobius, Aulophorus furcatus, Euilyodrilus bavaricus, Euilyodrilus heuscheri, Fauna, Habitats, Information, *Latvia, Limnodrilus helveticus, *Oligochaete, Psammoyetides moravious, Rhyacodrilus coccineus, Tubifex

Observations were carried out from 1962-1968 in the Liehupe River on the oligochaete fauna and its habitat. In the upper course of the river Lielupe (from Bauska to Islice), where firm ground prevails, only 14 oligochaete species live, mainly the representatives of the family Naididae. In the middle course (from Islice to Sloka) on the soft ground the amount of oligochaetes increases both qualitatively and quantitatively (25 spp.). There, the representatives of the family Tubificidae prevail. In the lower reaches of the Lielupe (from Isloka to the mouth of the river) on quicksand, which, in places, is covered with slime and detritus, 23 spp. were found, among which the representatives of the family Tubificidae prevail. At Jelgave, Kalnciems and at Lielupe railway station the qualitative composition of oligochaetes sich (17-20 spp.). Below Sloka where the ground is covered with cellulose fibers, the number of species falls sharply. In the Lielupe, the Veata and the Saka rivers, 8 oligochaete species new for the Latvian fauna were found: Aulophorus furcatus, Aulodrilus limnobius, Rhyacodrilus coccineus, Limnodrilus helveticus, Euilyodrilus bavaricus, E. heuscheri, Psammoryctides moravicus, Tubifex costatus. Thus 59 oligochaete species from 7 families are to be found in the freshwaters of Latvin.—Copyright 1972, Biological Abstracts, Inc. W73-05917

GROWTH IN EXPERIMENTAL POPULATIONS OF TILAPIA MOSSAMBICA, Bureau of Commercial Fisheries, Seattle, Wash. Biological Lab. R. P. Silliman.

Bioscience. Vol 20, No 20, p 1109-1110. 1970, Illus. Identifiers: *Growth, *Tilapia-mossambica, Food

The efficiency of food conversion of T. mossam-The efficiency of food conversion of 1. mossam-bics declines with increasing rations and increas-ing body size. The 2 relations are not independent because declining numbers as the fish grow cause the amount of food per fish to increase.—Copy-right 1972, Biological Abstracts, Inc. W73-06051

ECOLOGY OF AN ELFIN FOREST IN PUERTO RICO: 16. THE FLOWERING CYCLE AND AN INTERPRETATION OF ITS SEASONALITY, Harvard Univ., Cambridge, Mass. Gray Herbari-

L. I. Nevling, Jr. J Arnold Arbor Harv Univ. Vol 52, No 4, p 586-613, 1971, Illus.

Identifiers: Ecology, *Elfin forest, Flora, Flowering, Forests, *Puerto Rico, Seasonality, Light.

On the basis of the flowering and reproductive patterns shown by the plants of Pico del Oeste the flora appears similar to a tropical flora from lower altitudes minus some elements. The flora of the Pico has been derived from only a portion of such a flora. The missing elements are the herbaceous annuals and the massive and medium-sized trees. A firm indication of wet/dry seasonality remains in spite of the high total rainfall of the area. The effective species filter of the annuals and large trees

is to be found in the total climatic conditions present but most especially in the low light intensi-ty. The Pico del Oeste flora seems to be an agsy. The Field of Ceste flora seems to ear ag-gregation of species with a common ability to sur-vive under a low light regime and one which had its origin in the rainforest.—Copyright 1972, Biologi-cal Abstracts, Inc. W73-06101

RAINFALL AND EPIDEMICS OF THE SOUTHERN PINE BEETLE, Clemson Univ., S.C. Dept. of Entomology and Zoology. E. W. King. Environ Entomol. Vol 1, No 3, p 279-285. 1972. Il-

hs.

Identifiers: Alabama, "Pine beetles, "Dendroctonus frontalis, Epidemics, Florida, Georgia, Louisiana, Mississippi, North Carolina, "Rainfall, South Carolina, Texas, Mathematical studies."

Monthly rainfall during the immediately preceding known epidemics of Dendroctonus frontalis Zim-mermann in Texas, Louisiana, Mississippi, Alabama, Georgia, Florida, South Carolina, and North Carolina was compared with nonepidemic rainfall conditions for the period 1910-1962. It was rainfall conditions for the period 1910-1962. It was found (by statistical t-tests) that during this time epidemic years were characterized by low summer rainfall in Georgia; high winter rainfall in Texas; and high spring rainfall with low rainfall in early summer in North and South Carolina. Frequency tables of epidemics and their rainfall in these 3 areas are given. No evidence could be demonstrated to support the hypothesis that high rainfall at any season terminates an epidemic.—Copyright 1972, Biological Abstracts, Inc. W73-06344

EFFECTS OF SOIL MOISTURE STRESS ON FOLIAR NUTRIENTS OF LOBLOLLY PINE, Illinois Univ., Urbana. For primary bibliographic entry see Field 04A.

W73-06372 THE ORIGIN OF HOUSES IN THE

OKEFENOKEE PRAIRIES, Okefenokee National Wildlife Refuge, Waycross, For primary bibliographic entry see Field 02H. W73-06383

2.J. Erosion and Sedimentation

DISTRIBUTION OF MERCURY IN EAST PACIFIC SEDIMENTS, Miami Univ., Fla. Inst. of Marine and Atmospher-For primary bibliographic entry see Field 05A.
W73-05880

DISTRIBUTION OF MERCURY IN THE SEDI-MENTS OF NEW HAVEN (CONN.) HARBOR, Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 05B.
W73-05881

CONTENTS AND BEHAVIOUR OF MERCURY AS COMPARED WITH OTHER HEAVY METALS IN SEDIMENTS FROM THE RIVERS RHINE AND EMS, Institute for Soil Fertility, Haren-Groningen (Netherlands).

For primary bibliographic entry see Field 05B.

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS.
State Univ., Fort Collins, Dept. of Civil Engineering,
For primary bibliographic entry see Field 08B.
W73-03949

RIPPLE PROFILES MODELED MATHEMATI-CALLY, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 08B. W73-03965

THE RELATION OF PETROFABIRICS WITH DIRECTIONAL ORIENTATION OF MINERAL GRAINS FROM SOIL PARENT MATERIALS. AN EXAMPLE FROM NORWAY, Oalo Univ. (Norway).

R. Sen, and A. D. Mukherjee.
Soil Science, Vol 113, No 1, p 57-58, January 1972. 4 fig. 2 ref.

Descriptors: *Sediment transport, *Aeolian soils, *Glacial drift, *Petrofabrics, Particle shape, Soil formation, Residual soils, Microscopy, Alluvium, Loess. Identifiers: *Norway, *Soil fabric.

Petrofabric techniques were applied to the study of soil parent materials in order to determine the relation between the transportation and deposition of soil grains and their structural fabrics. Edian and glaciofluvial sediments from Romerike district, southeast Norway (sampled from below the frost zone) are surrounded by pre-cambrian, camtrict, southeast Norway (sampled from below the frost zone) are surrounded by pre-cambrian, cambro-silurian and permian igneous sedimentary, metamorphic, and volcanic rocks. The fabric shows that the direction of transport is NE-SW and NW-SE with a dominant force in the NE-SW directions. In the area, the style of structural fabric of mineral grains is influenced by directional transportation. (Knapp-USGS) W73-05967

SOME PROBLEMS OF SIMULATION ON ERODIBLE MODELS (NEKOTORYYE VOPROSY MODELINOVANIYA NA RAZ-MYVAYEMYKH MODELYAKH), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-05986

RESULTS OF FIELD INVESTIGATIONS OF DUNE MOVEMENT (REZULTATY NATURNYKH ISSLEDOVANTY DIVIZHENIYA ESCHANYKH GRYAD), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). N. M. Kulemina In: Gidravliko-morfologicheskiye issledovaniya rek i vodoyemov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 169, p 96-100, Leningrad, 1969. 2 fig., 1 tab, 6 ref.

Descriptors: *On-site investigations, *Dunes, *Movement, *Sediment transport, Bottom sediments, Profiles, Meanders, Water levels, Floods, Sounding. Identifiers: *USSR, Vychegda River, Bathygrams.

Results are presented of large-scale studies of dune movement in the Vychegda River near Syktyvkar during a flood in June 1966. Data on extent and rates of migration of dunes and on rates of transport and composition of bottom sediments were based on echo-sounding measurements along a 1,300-m stretch. The measured values of dune heights, lengths, and gradients agree with the values calculated from graphs. According to measurements, the rates of dune migration were several meters per day. (Josefson-USGS)

Field 02-WATER CYCLE

Group 2J—Erosion and Sedimentation

SEDIMENT TRANSPORT ON A RIVER BEND MODEL (GRYADOVOYE DVIZHENIYE NANOSOV NA MODELI RECHNOY IZLUCHIN-

audarstvennyi Gidrologicheskii Institut, Leningrad (USSR). Z. M. Velikanova.

In: Gidravilko-morfologicheskiye issledovaniya rek i vodoyemov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 169, p 87-95, Leningrad, 1969. 3 fig. 1 tab, 6 ref.

Descriptors: "Hydraulic models, "Meanders, "Sediment transport, "Sediment discharge, "Bed load, Bottom sediments, Dunes, Channel morphology, Channels, Flumes, Scour, Steady flow. Identifiers: *USSR, *Bed-load transport.

Studies were made of bed-load transport on a model of a river bend at different stages of formation of the scoured bottom. For steady flow conditions, the stretch of the bend should be divided into 3 zones, qualitatively similar in the character of movement of the bottom sediments. The division is based on the relation of bed-load transport to both the flow structure and morphological parameters of the stretch. (Josefson-USGS) W73-05988

A STRUCTURAL APPROACH TO CHANNEL MORPHOMETRY (O STRUKTURNOM PODK-HODE K RUSLOVOY MORFOMETRII), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 08B.
W73-05989

SOME ASPECTS OF THE GENESIS OF IRON-MANGANESE CONCRETIONS IN THE GULF OF RIGA (O NEKOTORYKH STORONAKH FORMIROVANIYA ZHELEZO-MARGAN-TSEVYKH KONKRETSIY RIZHSKOGO For primary bibliographic entry see Field 02L. W73-05990

PALEOMAGNETIC INVESTIGATIONS OF A LONG SEDIMENT CORE FROM THE WESTERN INDIAN OCEAN (PALEOMACNIT-NYYE ISSLEDOVANIYA DLINNOY KOLONKI IZ ZAPADNOY CHASTI INDIYSKOGO OKE-

ANA), Severo-Vostochnyi Kompleksnyi Nauchno-Iss-ledovatelakii Institut, Magadan (USSR). T. I. Lin kvoa, and A. P. Lisitsyn. Akademiya Nauk SSSR Doklady, Vol 201, No 2, p 335-338, 1971. 4 fig, 10 ref.

Descriptors: "Geophysics, "Magnetic studies, "Sedimentology, "Cores, "Indian Ocean, Bottom sediments, Sedimentation rates, Age. Identifiers: "USSR, Oozes, Natural remanent

agnetization, Magnetometers.

A paleomagnetic analysis was made of bottom-aediment cores collected during the 1955-59 Soviet Antarctic Expedition to the southern and central Indian Ocean. The age of the lower layers of a 1,078-cm-long core, taken at a depth of 4,980 m at lat 42 deg 54 min S, long 20 deg 66 min E, was about 3 million years (Pliocene). The average sedimentation rate is 3.6 mm/l,000 years. This figure is similar to that obtained for the same core using the ionium-protactinium method, which gives a rate of 3 mm/l,000 years for the last 400,000 years. (Josef-son-USGS)

PALEOGEOGRAPHY OF BELORUSSIA DUR-ING EARLY MIDDLE VALDAY DEPOSITION OF ALLUVIUM ON THE SECOND FLOOD-PLAIN TERRACE OF THE DNIEPER RIVER (PALEOGEOGRAFIYA BELORUSSII V RAN-

NIYE FAZY FORMIROVANIYA SREDNEVAL-DAYSKIKH GENERATSIY ALLYUVIYA GENERATSIY ALLYUVIYA NADPOYMENNOY TERRASY DAYSKIKH
VTOROV
NADPOYMENNOY
TERRASY
Oeografo-Ekonomicheskii Nauchno-Issledovatelskii Institut, Leningrad (USSR).
Kh. A. Arslanov, L. N. Vozzyachuk, F. Yu.
Velichkevich, N. A. Makhnach, and Ye. G.
Kalechits.
Nathrasia

Akademiya Nauk SSSR Doklady, Vol 200, No 6, p 1397-1400, 1971. 2 fig, 18 ref.

Descriptors: "Sedimentation, "Deposition (Sediments), "Alluvium, "Flood plains, "Terraces (Geologic), Glaciation, Glacial drift, Geologic time, Dating, Palynology, Plant populations, Vegetation, Forests.

Identifiers: *USSR, *Belorussia, *Dnieper River, *Paleogeography, Geochronology, Interstades.

Paleogeography, Geochronology, Interstades.

Investigations were conducted along the left bank of the Dnieper River near Krasnaya Gorka in Gomel' Oblast to study the geochronology and paleogeography of middle Valday interstadial deposits in southeastern Belorusaia and to date the oldest deposts of alluvium on the second floodplain terrace of the Dnieper. The formation of the second flood-plain terrace began during the early part of the middle Valday interstadial or soon after the maximum advance of the preceding glacial stage. The formation of the terrace was completed in late Valday time during maximum glaciation. Samples collected in 1969 from upper and lower peat layers gave dates of 38,500 plus or minus 1,700 years. According to published radiocarbon dates for middle Valday interstadial deposits, the alluvium of the second flood-plain terrace corresponds in age to: (1) periglacial alluvium of the second flood-plain terrace corresponds in age to: (2) 'interglacial' alluvium of the second flood-plain terrace corresponds in age to: (2) 'interglacial' alluvium of the second flood-plain terrace of the Vyatka River in Kirov Oblast; (2) 'interglacial' alluvium of the second flood-plain terrace of the Vyatka River in Kirov Oblast; (2) 'interglacial' alluvium of the second flood-plain terrace of the Watka River in Kirov Oblast; (2) 'interglacial' alluvium of the second flood-plain terrace of the Watka River in Kirov Oblast; (2) 'interglacial' alluvium of the second flood-plain terrace of the Malaya Kheta and Yenisey Rivers in northwestern Siberia; and (5) alluvium of the 'Karginskaya' terrace of the Malaya Kheta and Gold-plain terrace of Carpathian and Ciscarpathian Rivera. (Josefson-USGS)

LATE QUATERNARY AND HOLOCENE MARINE TRANSGRESSION IN THE LOWER AMUR AND UDYL'KIZI BASINS (POZD-NECHETVERTICHNAYA I GOLOTSENOVAYA INGRESSII MORYA V PREDELY NIZHNE-AMURSKOY IUDYL'KIZINSKOY VPADIN), Ministerstvo Geologii, Moscow (USSR).

N. P. Akhmet'yeva. Akademiya Nauk SSSR Doklady, Vol 200, No 5, p 1181-1184, 1971. 2 fig, 6 ref.

Descriptors: "Sedimentation, "Deposition (Sediments), "Basins, "Geologic time, "Quaternary period, Recent epoch, Water types, Freshwater, Saline water, Sea water, Groundwater, Surface waters, Springs, Water sampling, Water analysis, Water quality, Drill holes.

Identifiers: "USSR, "Transgression (Stratigraphic)" "Pulcoreceptors"

graphic), *Paleogeography.

Invasion of the Lower Amur and Udyl'-Kizi basins by the sea in Late Quaternary and Holocene times was investigated for paleographic reconstruction of the region. Data were obtained from drill holes in the basins (1960-68), water samples from Quaternary sediments of the Amur River valley and adjoining areas, and from additional water samples analyzed for iodine and bromine. Extension of the sea over the basins probably occurred in the last interglacial and postglacial stages, when the level of the ocean was at its highest. For water supply, villagers in the northern part of the Lower Amur basin are ad-

vised to use either surface waters or groundwaters circulating in folded basement and Mesozoic-Cenozoic volcanic rocks. (Josefson-USGS) W73-03994

AGE OF BAUXITE-BEARING SEDIMENTS OF THE TAEYEVA-YENISEY INTERFLUVE (O VOZRASTE BOKSITONOSNYKH OTLOZHEN-STY TASEYEVSKO-YENISEYSKOGO MEZH-DURECH'YA), O. N. Gracheva, A. P. Levina, and A. V. Leyptsig. Akademiya Nauk SSSR Doklady, Vol 200, No 3, p

668-671, 1971. 1 fig, 2 ref.

Descriptors: *Geology, *Sedimentology, *Sediments, *Interfluves, *Age, Geologic time, Palynology, Pollen, Spores, Vegetation, Forests, Trees, Exploration, Drill holes.

Identifiers: *USSR, *Siberia, *Bauxite, Neogene period, Paleogene period.

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Bauxite-bearing sediments filling the basin along upper reaches of the Yagodka River, a right tribuupper reaches or the Yagouka River, a right tribu-tary of the Yenisey, can be dated as Miocene to Pliocene. Neogene bauxite-bearing sediments have never before been found in this region. The imprecisely dated red bauxite-bearing sediments in other parts of the I was Assented imprecisely daucel red outsure-bearing sediments in other parts of the Lower Angara are also most likely of Neogene age. In the southwestern part of the Siberian platform and adjoining regions the deposition of bauxite-bearing sediments occurred not only in Late Cretaceous and Early Paleogene not only in Late Cretaceous and Later times but even continued into the Neogene period. The stratigraphic range of sediments favors bauxite propsecting is wider and the bauxite potential of many young basins in southern Siberia is greater than originally presumed. (Josefson-USGS) W73-05995

PHYSICO-CHEMICAL FACTORS IN EROSION

OF COHESIVE SOILS, California Univ., Davis. Dept. of Civil Engineer-

A. Sargunam, P. Riley, K. Arulanandan, and R. B.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, p 555-558, March 1973. 2 fig, 1 tab, 6 ref.

Descriptors: "Soil erosion, "Saline soils, "Cohesive soils, "Ion exchange, "Leaching, Pore water, Soil chemistry, Calcium, Sodium, Magnesium, Chlorides.

Critical hydraulic shear stress, defined as that stress which must be exceeded to cause erosion of a soil, is related to mechanical properties of the soil. Susceptibility of a cohesive soil to erosion also depends on the pore fluid composition. Cylindrical specimens were prepared by consolidation from slurries in which the pore fluid had been altered by the addition of Na, or Mg, or Ca chlorides. Using sodium salt, the critical shear stress increased markedly with increasing concentration even though the SAR was also increasing. The change in erosion rate for the calcium soil. The change in erosion rate for the calcium soil, however, is about one-twentieth that of the sodium soils. This probably results from the stronger interparticle bonds and the lesser hydration associated with absorbed calcium ions. The higher the interior pore concentration or the lower its SAR the greater will be the cohesion when the DAK the greater will be the cohesion when the pore space around surface particles swells to a new near-equilibrium volume. Increasing the concentration or reducing the SAR of eroding fluid will also increase the equilibrium cohesion of surface particles and limit surface particle swell. (K-napp-USGS) W73-05996

Erosion and Sedimentation—Group 2J

DEVELOPMENT OF A METHOD TO DETER-MINE ORTHO, PYRO, AND TRIPOLY-PHOSPHATE IN SEDIMENT, Missouri Water Resources Research Center, Columbia. For primary bibliographic entry see Field 05A. W73-06035

ADENOSINE TRIPHOSPHATE IN LAKE SEDI-

MENTS, Wisconsin Univ., Madison. For primary bibliographic entry see Field 05A.

STUDIES ON SOIL EROSION CONTROL: III. THE EFFECT ON GREEN BELTS ON SOIL EROSION (IN JAPANESE),
Obihiro Zootechnical Univ. (Japan). Lab. of Agricultural and Civil Engineering.
For primary bibliographic entry see Field 04D. W73-06090

A RAPID METHOD FOR SIZE ANALYSIS OF COARSE SEDIMENTS, Instituto Nacional de Limnologia, Santa Fe (Ar-

M. H. Iriondo.

Journal of Sedimentary Petrology, Vol 42, No 4, p 985-986, December 1972, 1 fig. 1 ref.

Descriptors: *Particle size, *Measurement, *Sedimentology, *Photography, Sediments.

A photographic method for size analysis of coarse sediments is proposed. The operator must be pro-vided with a camera and two rods divided into segvided with a camera and two rods divided into segments of suitable length. The rods are placed at both sides of the sampling area and a picture is taken. The clasts are counted in the picture by comparison of their minor visible axis with straight lines drawn between the rods. (Knapp-USGS) W73-06159

A SIMPLE APPARATUS FOR THE RAPID AND ACCURATE DETERMINATION OF BULK DEN-SITIES OR VOLUMES OF ROCK OR MINERAL FRAGMENTS, State Univ., of New York, Buffalo.

Journal of Sedimentary Petrology, Vol 42, No 4, p 982-984, December 1972. 1 fig, 2 tab, 2 ref.

Descriptors: *Bulk density, *Density, *Instrumentation, Equipment, Measurement, Sedimentology.

A very rapid, precise, accurate, and convenient apparatus is described for the determination of bulk densities or volumes of rocks, minerals, or clay specimens. The method is capable of yielding data on large numbers of samples per day. The apparatus consists of a heavy brass cylinder which rests upon the pan of a top-loading balance. One end of a U-shaped stainless steel rod is screwed into the top of the brass weight. The other end of the rod terminates in a four-pronged fork. Alongthe rod terminates in a four-pronged fork. Along-side the balance is placed a large laboratory jack atop which is placed a beaker containing ten pounds of mercury. A clean rock fragment of about 1 to 30 cc in volume is weighed in air on the balance. Without any sample under the prongs, the beaker is raised to the reference mark on the steel rod. The balance reading is taken. The beaker is lowered and the rock fragment placed securely under the prongs. The beaker is again raised to the reference mark and the balance reading taken. The pore openings in the septimen must not exceed 0.3 mm lest the mercury penetrate the sample. (K-napp-USGS) AN ESTIMATE OF SEDIMENT SIEVING TIME FROM COMPUTER SIMULATION, Virginia Univ., Charlottesville. Dept. of Environ-

tal Sciences. D. Poche.

Journal of Sedimentary Petrology, Vol 42, No 4, p 978-981, December 1972. 3 fig, 5 ref.

Descriptors: *Simulation analysis, *Particle size, *Sieve analysis, Computer programs, Sieves, Measurement.

Computer simulation of sieving was used to determine the proper amount of time required to completely sieve a sediment sample. The results suggest that the lower bound for the time to completely sieve a sediment sample into 1/4 Phi intervals is 50 min. The upper limit was found to be 109 min. It is suggested that either new methods or mechanical analysis or better theories of sieving must be developed. (Knapp-USGS) W73-06161

EXPERIMENTAL ERROR IN PEBBLE ROUND-NESS DETERMINATION BY THE MODIFIED WENTWORTH METHOD,

Texas Univ., Austin. Dept. of Geology.

Journal of Sedimentary Petrology, Vol 42, No 4, p 973-974, December 1972. 4 ref.

Descriptors: *Particle shape, *Sedimentology, *Equations, *Particle size, Sediments, Sampling, Data collections.

The quantitative method of roundness measure-ment is based on dividing the radius of curvature of the sharpest single corner by the radius of the largest inscribed circle. Quantitative measurement of shape includes the two different concepts of sphericity and roundness. Unfortunately, roundsphericity and roundness. Unfortunately, roundness measurement is subjective. To test the new quantiative roundness technique, a set of ten pebbles was selected to cover a wide range of roundness. Based on readings by thirty people, the standard deviation of roundness determinations for each pebble averaged plus or minus 094. There was a tendency for some operators to read systematically high and for others to be systematically low. About 75% of the error is in estimating the curvature of the sharpest corner, because not all reconle pick the same corner to measure, and the people pick the same corner to measure, and the corners may not be circular; it is thus somewhat difficult to find which of the template circles matches best. When two or more people are engaged as a team in pebble roundness studies, peb-bles should be measured in equal amounts by all operators. (Knapp-USGS) W73-06162

THE DESCRIPTION AND MEASUREMENT OF SEDIMENTARY PARTICLES AND THE CON-CEPT OF FORM,

CEPT OF FORM, Cambridge Univ. (England). Dept. of Geography. W. B. Whalley. Journal of Sedimentary Petrology, Vol 42, No 4, p 961-965, December 1972. 37 ref.

Descriptors: *Particle shape, *Sedimentology, *Equations, *Particle size, Sediments, Sampling, Data collections.

The defining equations for investigation of sedimentary aggregate properties and of individual particles are reviewed. The equation for individuals is extended in relation to components of 'form'. Form is defined as the expression of the external morphology of an object. These com-ponents are shape, sphericity, angularity, round-ness, and surface texture. Implications of this division are discussed with regard to measure nique and the need for such a division of form conents. (Knapp-USGS)

INITIAL FLUVIATILE FRAGMENTATION OF

GRANITIC QUARTZ, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia).

Organization A. J. Moss. Journal of A. J. Moss.

Journal of Sedimentary Petrology, Vol 42, No 4, p 905-916, December 1972. 8 fig, 12 ref.

L'escriptors: "Particle size, "Sediment transport, "Bed load, Sedimentation, Sedimentology, Ero-sion, Particle shape, Saltation, Suspended load, Sands, "Quartz. Identifiers: "Particle breakage (Sediments).

Fragmentation loads were measured for quartz from weathered samples of a granite and from points along a stream system draining the granite from weathered samples of a granite and from points along a stream system draining the granite surface. Stream transportation caused major destruction of 2-5 mm quartz in a few kilometers; 1-2 mm particles were less affected, and breakage of 0.5-1.0 mm quartz was more than compensated by production of new grains created by breakage of coarser ones. Most breakage probably occurs in the bedload zone during floods, particularly in the presence of moving pebbles. Greater mobility enables small grains to outlast larger, stronger ones in this environment. Not only are small grains more easily kept above the breakage zone in suspension but they are probably much more readily moved away from impending impact points between pebbles by momentary radiating currents generated around such points just before the pebbles impact. Downstream fining of river sediments is due to both hydraulic separation and breakage. Breakage is very important in headwater regions but its effectiveness probably wanes downstream in large rivers. (Knapp-USGS)

EMBAYED QUARTZ GRAINS IN SOILS AND

THEIR SIGNIFICANCE, North Carolina Univ., Wilmington. Dept. of

Geology. W. J. Cleary, and J. R. Conolly. Journal of Sedimentary Petrology, Vol 42, No 4, p 899-904, December 1972. 6 fig, 1 tab, 15 ref.

Descriptors: "Weathering, "Soil formation, "Quartz, "North Carolina, Solubility, Leaching, Particle shape, Residual soils, Mineralogy. Identifiers: Soil mineralogy.

Quartz-rich Ultisols of the Carolina piedmont and coastal plain show patterns of grain dissolution which may be used as an indicator of weathering intensity. The formation of sand-sized material begins with the dismemberment and dissolution of the saprolite and parent rock and forms grains with solution embayments. Further dismemberment occurs until grains show very irregular and skeleton-like outlines. Skeletal grains characterize the root zone which is probably the zone of greatest solution activity. The repetitive nature of the observed patterns of dissolution and grain production yield a model based on the degree of the amount of embayed quartz in the soil. The model proposes that after the initial release of the fragment, it is further modified by the soil water and as time proceeds and dismembering of the fragments occura, dis-Quartz-rich Ultisols of the Carolina piedmont and modified by the soil water and as the process, and dismembering of the fragments occurs, dissolution at the grain contacts continues. Eventually, as the zone of greatest activity develops, it is possible that a soil profile consisting dominantly of embayed monocrystalline quartz would develop. (Knapp-USGS) W73-06165

PALEO-CLIMATIC EVENTS INDICATED BY MINERALOGICAL CHANGES IN DEEP-SEA SEDIMENTS,

SEDIMENTS, Lamont-Doherty Geological Observatory, Palisades, N.Y. M. B. Jacobs, and J. D. Hays. Journal of Sedimentary Petrology, Vol 42, No 4, p 889-898, December 1972. 3 fig. 5 tab, 34 ref. NSF Grants GA 17197, GA 19690 ONR Grant N00014-

Field 02-WATER CYCLE

Group 2J-Erosion and Sedimentation

Descriptors: *Bottom sediments, *Pacific Ocean, *Paleoclimatology, *Clay minerals, Sedimenta-tion, Glaciation, Illite, Clays, Quartz, Provenance, Particle size, Quaternary period, Pleistocene

In the equatorial Pacific Ocean, from 11 m.y. B.P. (Middle Miocene) to 3.0 m.y. B.P. (Middle Pioceae) the sediments are characterized by an abundance of montmorillonite, 80% and more; 10 to 15% lilite; and about 5% kaolinite and chlorite combined. During the last 3 m.y. the abundance of montmorillonite decreases, reaching a concentration of 50% to 60% near the top of the Brunhes. During this same interval, illite abundance increases to 25% to 35% at the top of the Brunhes, with kaolinite and chlorite increasing in a similar manner to 10% to 15%. The apparent decrease of montmorillonite in the Pleistocene is a dilution effect, the result of an influx of other clay minerals (likte and chlorite) from increased weathering, surface runoff, and wind activity with the intensification of continental glaciation. Increases in quartz and other detrital minerals and an increase in quartz and other detrital minerals and an increase in quartz and other detrital minerals and an increase in quartz and other detrital minerals and the Brunhes normal epoch provide supporting evidence of increased continental erosion with the advent of worldwide climatic cooling. Increased quantities of fine grained minerals were released during the major periods of continental glaciation to produce an imprint on oceanic sedimentation. (Knapp-USGS) usgs) W73-06166

'GLACIAL' MICRO-TEXTURES ON QUARTZ AND HEAVY MINERAL SAND GRAINS FROM THE LITTORAL ENVIRONMENT, Florida State Univ., Tallabassec. Dept. of Geolo-

gy. L. W. Setlow, and R. P. Karpovich. Journal of Sedimentary Petrology, Vol 42, No 4, p 864-875, December 1972. 9 fig, 1 tab, 11 ref.

Descriptors: "Particle shape, "Sands, "Beaches, Sedimentology, Particle size, Beach erosion, Sedi-mentation, Sediment transport, Quartz, Mineralo-gy, Florida, Sediments, Electron microscopy.

Surface breakage features on mineral grains described as diagnostic for glacial environments have been observed on quartz and heavy minerals from low to high energy beaches. 'Glacial' features by themselves, however, cannot be used as a valid criterion for environmental interpretation; quantitative analysis reveals that a large variety and abundance of physical surface features characterizes textures produced in glacial environments. Minerals examined with the scanning electron microscope and differential interference-context microscope include amphibole, epidote, garnet, ilmenite, kyanite, quartz, staurolite, tourmaline, and zircon. Surface microtextures of the heavy minerals are described. (Knapp-USGS) W73-06167

SEDIMENT TRANSPORT OF ESTUARY EN-TRANCE SHOALS AND THE FORMATION OF SWASH PLATFORMS, Skidaway Inst. of Oceanography, Savannch, Ga. For primary bibliographic entry see Field 02L. W73-06168

BIMODAL COMPOSITION AND CYCLIC CHARACTERISTICS OF BRACH SEDIMENT IN CONTINUOUSLY CHANGING PROFILES, Louisiana State Univ., Baton Rouge. Coastal Stu-Louisiana dies Inst. C. J. Sonu

Journal of Sedimentary Petrology, Vol 42, No 4, p 852-857, December 1972. 5 fig. 19 ref.

Descriptors: *Beaches, *Sediment transport, *Sedimentation, *Sediment sorting, Sedimentology, Stratigraphy, Geomorphology, Beach erosion, Particle size, Surf, Waves (Water), Profiles, Variability, Sampling, *North Carolina.

Identifiers: *Outer Banks (N.C.).

Identifiers: *Outer Banks (N.C.).

Sediment deposited on a continuously changing subaerial beach on the Outer Banks, North Carolina, exhibits variations in size distribution ranging from unimodal fine. A shift from one end of this range to the other coincides with the progress of a beach cycle in which a beach, after being eroded by a storm, restores itself to a fully accretive state over a period of approximately two months. In the early phase of beach recovery, coarse material with unimodal distribution appears at the beach front in the form of a swash bar. The swash bar, because of its porous texture, tends to arrest fine materials subsequently washing up on the beach, adding a second mode to the size distribution curve. Accretion is aided by the loss of backwash into runnels behind the swash bar, as well as into the swash bar and the consequent spreading of fine materials on the beach. Thus, the second mode, representing coarse fractions, and finally becomes the sole mode in the size distribution curve by the time when the swash bar reaches the upper limit of runny. As this beach is subsequently eroded by a storm, the swash bar tends to disintegrate and, correspondingly, the zone of coarse materials diminishes seaward, disappearing eventually into the sea bed when the beach assumes a maximum state of erosion. Under this condition, beach deposits continue to be unimodal fine sediment until a swash bar emerges at the shoreline to initiate the process of beach recovery. (Knapp-USGS)

RIBBED GROOVES AND TRACKS IN MUD TIDAL FLATS OF COLD REGIONS, Centre de Recherches Forestiere des Laurentides,

Quebec. J-C. Dionne. Journal of Sedimentary Petrology, Vol 42, No 4, p 848-851, December 1972. 7 fig, 20 ref.

Descriptors: "Sedimentary structures, "Mud flats, "Ice, "Arctic, Mud, Intertidal areas, Cold regions, Ice breakup, Tides, Tidal effects, Sediments, Ice cover, Sea ice.

Ribbed grooves, resembling bulldozer tracks and animal ribbed trails, develop in mud tidal flats of the St. Lawrence Estuary, Quebec, during breaknup. They are perpendicular to the tidal currents and are made by ice blocks scratching the surface of the tidal flat when being carried seaward by eeb currents. A peculiar track 20 cm wide and 50 m long, parallel to ebb currents, was also discovered. The origin of the track is not known but, if it is a natural feature, it may be ice-made. (Knapp-USGS) W73-06170

HOLOCENE AND PLEISTOCENE CALCARE-OUS CRUST (CALICHE) PROFILES: CRITERIA FOR SUBAERIAL EXPOSURE, McGill Univ., Montreal (Quebec). N. P. James.

N. P. James. Journal of Sedimentary Petrology, Vol 42, No 4, p 817-836, December 1972. 12 fig, 1 tab, 58 ref. NRC Grant A-2128.

Descriptors: *Caliche, *Limestones, *Weathering, *Diagenesis, Calcium carbonate, Mineralogy, Stratigraphy, Sedimentation, Sedimentology. Identifiers: *Barbados.

Surficial, calcareous crusts consisting of hard, irregular, subhorizontal, calcareous laminae, surrounded by crumbly, chalky carbonate, form at the surface of many limestone successions in semiarid areas. On northern Barbados, diagenesis of limestone in such profiles creates a diagnostic, repeatable set of textures and fabrics. The original limestone is altered by brecciation, recrystallization (to microspar), micritization and boring. The

CaCO3 thus put into solution and augmented by CaCO3 from fallout and salt spray is reprecipitated as calcite in the form of crystals often quite different from those in the vadose zone below. Calcite crystals are precipitated as flower spar, micrite, random needle fibers, and tangential needle fibers. Several of these crystal morphologies are similar to those precipitated from highly supersaturated solutions or solutions that contain appreciable amounts of other dissolved ions. These 4 basic crystal types are not only precipitated as void-filling cement, but, more important, combine to form characteristic structures such as oolith-like coated particles, pelletoids, and the laminar crusts themselves. These diagenetic textures and fabrics are also the basic units of many Florida and Middle East calcareous crust textures and fabrics are also the basic units of many Florida and Middle East calcareous crust (caliche) profiles, suggesting that the above features may be characteristic of calcareous crust profiles in general. Fossil calcareous crusts and associated features, buried in the Pleistocene ilimestone succession on northern Barbados without alteration, indicate that these features may well be preserved as indicators of subaerial exposure in the fossil record. (Knapp-USGS) w73-06171

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CHEMICAL COMPOSITION OF INTERSTI-TIAL WATERS FROM MARINE SEDIMENTS, BAFFIN BAY, Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of Geology.

ary bibliographic entry see Field 02L. For primar W73-06172

THE ROLE OF SUBAQUEOUS DEBRIS FLOW IN GENERATING TURBIDITY CURRENTS, Rhode Island Univ., Kingston. Dept. of Geology.

M. A. Hampton.

Journal of Sedimentary Petrology, Vol 42, No 4, p
775-793, December 1972. 14 fig, 3 tab, 46 ref.
USGS Contract 14-08-0001-1084.

Descriptors: "Turbidity currents, "Debris avalanches, "Landslides, Density currents, Mud-flows, Mass wasting, Mixing, Sediment transport, Sedimentation, Model studies. Identifiers: "Debris flows.

Identifiers: *Debris flows.

Turbidity currents are generated in the oceans as part of the sequence from landsliding through debris flow to turbidity current flow. The transition from landsliding to debris flow occurs when water is incorporated into the debris. In the marine environment, conditions are favorable for the development of subaqueous debris flows from subaqueous landslides. The critical thickness of debris varies directly with strength and inversely with submerged unit weight and slope angle. Distinct zones of viscous shear and nondeformation exist in a subaqueous debris flow to turbidity-current flow involves dilution from about 2.0 gm/cc to about 1.1 gm/cc. Mixing into the body of the flow can result from flow instability, either by breaking interface waves or by momentum transfer associated with turbulence. Mixing due to the instability is inhibited by the presence of clay and coarse granular solids in debris. Mixing by erosion from the front of a debris flow is a more typical process of generating turbidity currents because this mixing is a natural consequence of debris flowing through water. (Knapp-USGS)

FORMATION OF JOINTS IN BEDROCK BY MOVING GLACIAL ICE, Geological Survey, Albuquerque, N. Mex. For primary bibliographic entry see Field 02C. W73-06224

PROBLEMS OF RIVER BED DEFORMATION IN A CONFLUENCE ZONE, Institut za Vodorivredu Jaroslav Cerni, Belgrade (Yugoslavia).

J. Muskatirovic.

J. Muskatirovic.

Available from NTIS, Springfield, Va 22151 TT 69-51009/4 Price \$5.45 printed copy; \$0.95 microfiche. In: Transactions 'Jaroslav Cerni', Institute for Development of Water Resources, Vol 16, No 48, p 15-35, 1970. 8 fig. 2 tab, 8 ref. (Translation of Saopstenja Instituta za Vodoprivredu 'Jaroslav Cerni', Vol 16, No 48, p 15-35, 1970.)

Descriptors: *Sedimentation, *Sediment transport, *Streamflow, *Bed load, *Channel morphology, Rivers, Tributaries, Influent, Model studies, Mathematical studies, Hydraulic models, River beds, Forecasting, Sediment control. Identifiers: *Yugoalavia, Watercourses, River bed deformation, Confluence zone.

deformation, Confluence zone.

Sedimentation in confluence zones is very important in the regulation of watercourses. It can have a number of undesirable consequences such as reduction of depth, change in width of the river, and bank erosion. In order to insure stability of the confluence, it is necessary that the main river and its tributary have sufficient water and sediment capacity above the confluence and that changes of water and sediment discharge do not cause great alterations in the bottom configuration after the confluence. If measurements of hydraulic properties and of water and sediment discharges for both the tributary and the main river are available, hydraulic analysis is the best procedure for determining optimum dimensions of the regulated bed. After comprehensive tests which include registering changes of hydraulic properties and bed configuration in the confluence zone for different ing changes of hydraulic properties and bed con-figuration in the confluence zone for different regulation variants and different combinations of regulation variants and different combinations of water and sediment discharge, a regulation variant may be selected to insure stability. (Woodard-USGS)
W73-06229

MORAINE LITHOLOGY AND ITS RELATION-SHIP TO ROCKS OF A GLACIER BED (LITOLOGICHESKIY SOSTAV MOREN I YEGO ZAVISIMOST' OT POROD LED-TEGO ZAVISIMOST' OT POROD L NIKOVOGO LOZHA), Leningrad State Univ. (USSR). For primary bibliographic entry see Field 02C. W73-06232

ROLE OF CLAY MINERALS IN THE ACCUMULATION AND TRANSFORMATION OF ORGANIC MATTER IN RECENT SEDIMENTS OF THE CASPIAN SEA (O ROLI GLINISTYKH MINERALOV V NAKOPLENII I PREOBRAZOVANII ORGANICHESKOGO VESHCHESTVA V SOVREMENNYKH OSADKAKH KASPIY SKOGO MORYA), Azerbaidzhanskii Nauchno-Issledovatelskii Institut po po Dobyche Nefti, Baku (USSR).
A. A. Ali-Zade, P. A. Shoykhet, M. B. Kheirov, and A. K. Pokidina.
Litologiya i Poleznye Iskopayemyye, No 1, p Litologiya i Poleznyye Iskopayemyye, No 1, p 105-114, January-February 1972. 5 fig, 2 tab, 13

Descriptors: "Geochemistry, "Sedimentology, "Lake sediments, "Clay minerals, "Organic matter, Organic compounds, Diagenesis, Analytical techniques, X-ray diffraction, Electron microscopy.

Identifiers: *USSR, *Caspian Sea, Pelites, Bitumens, Hydromica, Thermography, Thermograms.

Comprehensive geological and geochemical investigations were carried out in the southern part of the Caspian Sea to study the role of clay minerals in the accumulation and transformation of organic matter in recent sediments. Analytical techniques employed include general geochemical analyses, X-ray diffraction, electron microscopy,

and thermography. A definite relation was established between the areal distribution of clay minerals of the montmorillonite group and bituminous substances, including hydrocarbons. (Josefson-USGS)

MINERALOGICAL STUDY OF THE HEAVY FRACTION OF MARINE SEDIMENTS ON THE CONTINENTAL SHELF OF THE SEA OF JAPAN (MINERALOGICHESKOYE IZUCHENIYE TYAZHELOY FRAKTSII MOR-SKIKH OSADKOV SHEL'FA YAPONSKOGO

SKIKH OSADKOV SHEL-FA YAPONSKOGO MORYA),
Moskovskiy Geologorazvedochnyy Institut im. S. Ordzhonikidze, Moscow (USSR) Moskovskii Geologorazvedochnyi Institut (USSR).
V. P. Vorob'yev, and V. S. Chernysheva.
Izvestiya Vysshith Uchebnykh Zavedeniy, Geologya i Razvedka, No 1, p 42-50, January 1972. 3 fig, 2 tab, 3 ref.

Descriptors: *Mineralogy, *Sedimentology, *Sediments, *Continental shelf, *Metals, Heavy metals, Gold, Iron, Titanium, Placer mining, Structural geology, Provenance, Shores, Coasts, Bays, Spectroscopy.

Identifiers: *USSR, *Sea of Japan, Cassiterite.

Mineralogical analyses of marine sediments were made in 1968-70 in the shallow-water zone of the continental shelf of the Sea of Japan along the southern coast of the Soviet Maritime Territory conunental shelf of the Sea of Japan along the southern coast of the Soviet Maritime Territory between Pos'yeto Bay and the Bight of Eustathius. About 900 samples were collected from a total of 600 stations. The amounts of the heavy fraction yielded by the sediments were usually small. In 95 of 100 of all samples it was only 0.1%-0.15%. A clear pattern was observed in the distribution of the contents of the heavy fraction along the submarine slope in the direction normal to the shoreline. Maximum concentrations of the heavy fraction were found at the heads of bays at depths of 8-10 m. The 36 minerals identified in the fraction and spectral analysis of 20 elements in some of the minerals suggest the presence of gold and cassiterite deposits in land areas from which the sediments were derived. In light of the geological structure of the land and the negligible content of heavy minerals in the sediments, the development of large placers of iron and titanium in this region is unlikely. (Josefson-USGS)

RAPID FIELD TECHNIQUE USING SPRAY AD-HESIVE TO OBTAIN PEELS OF UNCON-BESIVE TO OBTAIN FEELS OF UNCON-SOLIDATED SEDIMENT, Columbia Univ., New York. Teachers Coll. W. E. Yasso, and E. M. Hartman, Jr. Sedimentology, Vol 19, No 3-4, p 295-298, December 1972. 1 fig. 5 ref.

Descriptors: "Sampling, "Sedimentology, "Sedimentary structures," Adhesives, On-site data collections, Data collections. Identifiers: "Sediment peels (Sampling).

A synthetic rubber base spray adhesive may be used to obtain high-relief, rapidly drying peels of moist unconsolidated beach sand. Samples from vertical planar trench walls and box coring devices are obtained instantaneously and completely hardened in about 15 additional minutes, with drying times dependent primarily on air temperature. This technique can also be used for preservation of sediment-core structures in the laboratory. (K-nam-LINGS) napp-USGS) W73-06241

AN INTERPRETATION AND ANALYSIS OF RECUMBENT-FOLDED DEFORMED CROSS--REDDING,
Reading Univ. (England). Sedimentology
Research Lab.
J. R. L. Allen, and N. L. Banks.

Sedimentology, Vol 19, No 3-4, p 257-283, December 1972, 8 fig. 73 ref.

Descriptors: *Sedimentary structures, *Alluvium, *Folds (Geologic), Deltas, Drag, Deformation, Earthquakes, Settling velocity, Bed load, Sedimentation, Sedimentology. Identifiers: *Pluidized sediments, *Syndepositional deformation.

Identifiers: "Pluidized sediments, "Syndepositional deformation are found in cross-bedded sand-grade sediments. The first type is characterized by simple recumbent folds of broadly parabolic form. The second is marked by series of folds, with or without overturning. The third type is much more complex, presenting a combination of faulting, folding, and he local destruction of bedding. The type marked by recumbent folds is interpreted as due to the deformation of a liquefied (or perhaps fluidized) and by current drag following an event in the majority of cases suspected to be an earthquake shock. By reference to empirical and theoretical studies of sedimenting systems and the behavior under small shear stresses of liquids of high viscosity, this physical model is developed analytically to yield equations describing the geometry of the deformations in terms of the thickness of the deformed bed, the settling velocity and concentration of particles in the liquefied sand, and the magnitude of the deforming force. The equations describe a fold surface that is a portion of a flat-lying parabola, and show that the proposed circumstances of deformation are plausible in terms of what is known of the real situation. They further reveal that, under the assumptions made in the analysis, the vertical height of the fold hinge above the base of the bed is a function only of the initial shape of the deformations calculated from the equations agree well with patterns observed from the geological record. (Knapp-USGS)

FLUVIAL AND ESTUARINE SEDIMENTS EX-POSED ALONG THE OUDE MAAS (THE NETHERLANDS), San Diego State Coll., Calif. Dept. of Geography. For primary bibliographic entry see Field 02L. W73-0624.

BEDFORMS-THEIR DEVELOP-AEOLIAN BEDFORMS-1 HER DEVELOS-MENT AND ORIGINS, Reading Univ. (England). Sedimentology Research Lab. I. G. Wilson. Sedimentology, Vol 19, No 3-4, p 173-210, December 1972. 8 fig. 1 tab, 42 ref.

Descriptors: *Sedimentary structures, *Dunes, *Geomorphology, Acolian soils, Sediment transport, Sedimentation, Sedimentology, Duen sands, Wind erosion.

Identifiers: *Aeolian bedforms.

Acolian bedforms arise spontaneously by a two-way interaction between surface form and airflow involving material transfer between them. At dynamic equilibrium, transverse elements migrate downwind. Acolian bedforms are compounded of elements from drass, dunes, scrodynamic ripples and impact ripples, each subdivided into trans-verse and longitudinal elements. There are no transitional forms between the elements of these eight subgroups, and they are interpreted as being formed by different mechanisms. The possible na-ture of these mechanisms is considered and qualitative models for the development of trans-verse and longitudinal elements given. Transverse and longitudinal elements may be combined in three different ways according to whether or not one element is displaced half a wavelength on crossing the other. (Knapp-USOS)

Group 2J—Erosion and Sedimentation

RUNOFF PROCESSES AND SLOPE DEVELOP-MENT IN BADLANDS NATIONAL MONU-MENT, SOUTH DAKOTA, Vrije Universiteit, Amsterdam (Netherlands), Inst. of Earth Sciences.

G.B. Engelea.

Journal of Hydrology, Vol 18, No 1, p 55-79,

January 1973. 14 fig, 1 tab, 17 ref.

Descriptors: "Erosion, "Geomorphology, "Gullies, "Rill erosion, "Runoff, Gully erosion, Headward erosion, Canyons, Sediment transport, Sheet erosion, Surface runoff, "South Dakota.
Identifiers: "Badlands (S Dak).

Recent observations of badland slopes in South Dakota before, during and after a rainstorm revealed the temporary existence of a dense, integrated drainage network of micro-rills. The network was completely obliterated by destication cracks within a few hours after the end of the rains. The micro-rills can be compared to the numerous parallel guilles or barrancas on the slopes of desert mountain ranges. Thus the badland forms of South Dakota can probably be considered as scale models of the desert ranges with their pediscale models of the desert ranges with their pedi-ments. Not only the forms and sediment sizes are ments. For only the forms and sediment sizes are scaled down but also the time scale is considerably shortened as can be seen from the brief temporary existence of the micro-rills and the other micro-features on the upper pediment. (Knapp-USGS) W73-06245

CUMMINGTONITE-DACITE DRIFT PUMICE STRANDED AT WEST PALM BEACH.

FLORIDA, Woods Hole Oceanographic Institution, Mass.

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. W. B. Bryas. Geological Society of American Bulletin, Vol 83, No 12, p 3745-3746, December 1972. 1 tab, 6 ref. NSF Grant GP4384 ONR Contract N00014-66-C-

Descriptors: *Mineralogy, *Provenance, *Sediments, *Beaches, *Florida, Volcanoes, Lava, ments, *Beaches, *Florida, Volcanoes, Lava, Sediment transport. Identifiers: *Pumice, *West Palm Beach (Fla), *St. Lucia (West Indies).

Three small pieces of pumice were collected from the beach at West Palm Beach, Florida. These and other similar fragments were lying loosely on the surface near the high-tide line and appeared to be recently deposited. Superficially, they are similar to the South Sandwich Islands pumice. A reasonable source for this pumic may be found in the West Indies on the southwest coast of St. Lucia. The Balford pumic flow reaches the coast along a west indies on the southwest coast of St. Lucia.
The Belfond pumic flow reaches the coast along a front of more than 2 mi, where small amounts of pumice might readily be released periodically by storm waves. Pumice so released would tend to be carried into the Caribbean and then north along the Florida coast by the Gulf Stream. (Knapp-USGS) W73-06248

CHANGES IN A BRAIDED REACH, Sheffield Univ. (England). Dept. of Geography.

A. D. Knighton. Geological Society of America Bulletin, Vol 83, No 12, p 3813-3821, December 1972. 7 fig, 2 tab, 17

Descriptors: *Braiding, *Channel morphology, *Sediment transport, Bed load, Discharge (Water), Sedimentation, Roughness (Hydraulic), Geomorphology, Regime, Meanders. Identifiers: *River Dean (England).

The form and hydrology of a braided reach change with lateral migration of the channel. Point-bar and island deposition in one channel compensate for enlargement of the other as the streamflow pattern is modified. The rapidity of these changes can be attributed to the widerange of flows involved in erosion and to the flashiness of the regime. One channel may begin to dominate the flow to the ex-

clusion of others in braided reaches where large differences in stream behavior exist between jux-taposed channels. (Knapp-USGS) W73-06249

ALLOMETRIC GROWTH: A USEFUL CON-CEPT IN GEOMORPHOLOGY, Colorado State Univ., Fort Collins. Dept. of

Geology, M. P. Mosley, and R. S. Parker. Geological Society of America Bulletin, Vol 83, No 12, p 3669-3673, December 1972. 2 fig, 10 ref.

Descriptors: "Geomorphology, "Land forming, "Growth rates, Topography, Erosion, River basins, Mathematical studies.
Identifiers: "Allometric growth (Geomorphology).

The instances of allometric growth in geomorphology are examples of size-related allometric relations, and not of allometric growth relations. The principle of allometric growth was first developed by biologists, and states that the ratio of the relative growth rate of an organ to that of the whole organism remains constant. Allometric relations are identical with the power-function relations found in all empirical sciences. Data from an experimental study of drainage network evolution do not support the concept of allometric growth, and a brief theoretical survey suggests that there is no reason to expect that river systems should exhibit allometric growth. (Knapp-USGS) W73-06250

SEDIMENTARY STRUCTURES IN BASE-SURGE DEPOSITS WITH SPECIAL REFERENCE TO CROSS-BEDDING, UBEHEBE CRATERS, DEATH VALLEY, CALIFORNIA, California Univ., Santa Barbara. Dept. of Geologi-

B. M. Crowe, and R. V. Fisher. Geological Society of America Bulletin, Vol 84, No 2, p 663-681, February 1973. 14 fig, 3 tab, 39

Descriptors: *Sedimentary structures, Sedimenta-tion, Sediment transport, *Volcanoes, Deposition (Sediments), *California, Stratification, Density

currents.

Identifiers: *Ubehebe Craters (Calif), *Base-surge deposits, *Sedimentation (Volcanic), *Pyroclastic flows.

Tuff derived from Ubehebe Crater, the largest crater in Death Valley, California, is characteristi-cally thinly bedded or laminated and was deposited by airfall and base-surge processes. Thick-bedded deposits showing evidence of mass deposited by airfall and base-surge processes. Thick-bedded deposits showing evidence of mass flow occur where base surges were concentrated within, and follwed gullies which had been carved into the fanglomerate prior to eruption. Cross-bedded sequences were deposited by base surges that moved radially outward from Ubehebe Crater. They occur in the form of relatively small and large dunelike structures with spacing and morphologic features similar to antidunes and migration patterns somewhat similar to climbing ripples. The largest dunes in the area are composite structures that preserve a sequence of bedforms deposited in the high flow regime. Deposition apparently began in the antidune phase of the upper flow regime, progressing in time through sinuous lamination to plane beds as flow power decreased. Laminations are well developed and bedforms are preserved at each level within the composite structures because of a high rate of deposition and high sediment cohesion during flow of the base surges. (Knapp-USGS)

THIRTY-YEAR PHOTOGRAPHIC RECORD OF A SHALE PEDIMENT, HENRY MOUNTAINS, UTAH,

ns Hopkins Univ., Baltimore, Md.

Geological Society of America Bulletin, Vol 84, No 2, p 689-695, February 1973, 6 fig. 4 ref.

Descriptors: "Erosion, "Terrace (Geologic), "Geomorphology, "Graded Sediment transport, Surfaces, Degradation (Stream), Gradients (Stream), Headward erosion, Profiles, Slopes, Photography, Data collections, "Utah. Identifiers: "Pediments."

A 30-year photographic record of a shale pediment in the Henry Mountains region, southeastern Utsh, shows almost no change in the position and shape of minute rills or the position of small stones scattered on the surface. The shale formations in scattered on the surface. The shale formations in that region are greatly eroded by every storm, as is plainly indicated by the sediment load carried to the main streams. Therefore, the rapid erosion must be concentrated in the badland slopes at the heads of the pediments. The steep slopes erode rapidly; the small amount of change on the pediments shows that they are truly graded surfaces. (Knapp-USGS)
W73-0c24

URANIUM AND THORIUM CONCENTRA-TIONS IN WIND-BORNE SAHARAN DUST OVER THE WESTERN EQUATORIAL NORTH ATLANTIC OCEAN, Rosenstiel School of Marine and Atmospheric Sciences, Miami, Fla. For primary bibliographic entry see Field 02K. W73-06401

EFFECTS OF WEATHERING ON ORGANIC MATTER IN SHALES, Atlantic Richfield Co., Dallas, Tex.

D. Leythaeuser. Goechimica et Cosmochimica Acta, Vol 37, No 1, p 113-120, January, 1973. 2 fig, 3 tab, 12 ref.

Descriptors: *Weathering, *Organic matter, *Shales, Stable isotopes, Oxidation, Leaching, Geochemistry, Carbon, Hydrolysis, Hydration, Solubility, Biodegradation.

Solubility, Biodegradation.

The effects of weathering on amount and composition of the organic matter finely disseminated in shales were studied using two suites of samples from the rock out crop and analyzed for the total organic matter content, its soluble fraction, and its insoluble fraction. The most drastic changes of the organic material occur over the near-surface 3 m intervals. The organic carbon content decreased up to one-fourth. The soluble organic matter content decreased up to one-half. The composition of the soluble organic matter changed, the proportion of hydrocarbons increased. The carbon isotope composition of the insoluble organic matter was enriched up to 0.05% in Cl3. Therefore, organic geochemical data obtained from analysis of surface samples should be interpreted with caution. Conversely, the technique may be used to determine accurately the depth of the weathering zone in sedimentary rocks which contain finely discoved cereasic matter. (Kasan, 1965) dispersed organic matter. (Knapp-USGS)
W73-06402

MERCURY IN LAKE SEDIMENTS: A POSSIBLE INDICATOR OF TECHNOLOGICAL GROWTH,
Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research Group. nary bibliographic entry see Field 05B. For primar W73-06405

2K. Chemical Processes

THE QUALITY OF GROUND WATER IN RELA-TION TO IRRIGATION AGRICULTURE IN

NORTHWESTERN NEW SOUTH WALES, AUS-

TRALIA, University of New England, Armidale (Australia). For primary bibliographic entry see Field 03C. W73-05908

ANALYTICAL STUDY OF THE PHOSPHORESCENCE OF PURINES IN AQUEOUS SOLUTION AT 77 DEGREE K,
Florida Univ., Gainesville. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-6013

PHOSPHORESCENCE STUDY OF EXCITED TRIPLET STATE PROPERTIES OF SOME K VITAMINS AND THEIR ANALYTICAL USE-

FULNESS, Florida Univ., Gainesville. Dept. of Chemistry.
J. J. Aaron, and J. D. Winefordner.
Analytical Chemistry, Vol 44, No 13, p 2122-2127,
November 1972. 7 fig. 3 tab, 39 ref.

Descriptors: "Chemical properties, "Chemical analysis, "Aqueous solutions, Pollutant identification, Alcohols, Irradiation, Ultraviolet radiation. Identifiers: "Phosphorescence, "Vitamin K, Organic solvents, Detection limits, Phosphorimetry, Phosphorescence spectra, Ultraviolet spectra, Emission spectra, Ethanol, Hexane, Deionized water, Methanol, Chemical structure, Vitamin K1, Vitamin K3, Vitamin K5.

Phosphorescence excitation and emission spectra and lifetimes of Vitamins K1, K3, and K5 heve been determined at 77 degree K in several solvents (n-hexane, methanol, ethanol, and mixtures methanol-water). Phosphorescence bands are attributed to n, pi triplet states for vitamin K5. Phosphorescence analytical characteristics of those vitamins are given for six different solvents. Limits of detection range between 0.07 and 1.5 micrograms/ml, according to the structure of the vitamin, but are not significantly influenced by the nature of the solvent. The usefulness of phosphorimetry for the quantitative determination of vitamins K1 and K3 is compared with other analytical methods and is shown to compete favorably with those methods. (Holoman-Battelle) W73-06014

SECONDARY ION MASS ANALYSIS: A TECHNIQUE FOR THREE-DIMENSIONAL CHARACTERIZATION, Illinois Univ., Urbana. Materials Research Lab. C. A. Evans, Jr. Analytical Chemistry, Vol 44, No 13, p 67A-68A, 70A, 72A, 74A-76A, 78A, 80A, November 1972. 5 fig, 1 tab, 25 ref.

Descriptors: "Spectroscopy, "Ions, "Surfaces, "Chemical analysis, Spectrometers, Pollutant identification, Isotope studies, Ion exchange, Instrumentation.

Identifiers: "Ion probe, Primary ions, Secondary

'ton probing' of a material involves bombarding the sample with a beam of 1-20 KeV ions (primary ions) causing the upper atomic layers to be 'sputtered' (stripped) off as neutral atoms or molecules, or ejected as charged ions. These secondary ions are extracted into a mass spectrometer for mass/charge separation for material analysis. Control and localization permit analysis with resolution of about 1 micrometer, examination of fractional surface layers, in-depth analysis with 50-100 anastrom resolution. and acquisition of secondary tional surface layers, in-depth analysis with 30-100 angstrom resolution, and acquisition of secondary ion images. Basic instrumentation includes: ion source and focusing optics for primary ions, a sample chamber, a mass spectrometer, and a detection system for ion detection and imaging. A section on instrumentation is provided. Applications include surface analysis of all the elements, detection of hydrocarbon types, isotopic labeling and exchange studies, identification of metal im-purities, microcharacterization and other 3-dimen-sional micro-analytical determinations. (Mackan-Battelle) w73-05015

THE DEVELOPMENT OF AN INSTRUMENTAL COMBUSTION METHOD FOR THE RAPID DETERMINATION OF TOTAL PHOSPHORUS IN AQUEOUS SOLUTIONS, Michigan State Univ., East Lansing. Inst. of Water Research. For primary bibliographic entry see Field 05A. W73-06020

ENVIRONMENTAL TRITIUM AS A HYDROMETEOROLOGIC TOOL IN THE ROSWELL BASIN, NEW MEXICO, New Mexico Inst. of Mining and Technology, Secorto. Dept. of Geoscience.
For primary bibliographic entry see Field 02A.
W73-06022

INVESTIGATION OF PRESENT THERMAL REGIME OF MISSOURI RIVER IN MISSOURI, Missouri Water Resources Tesearch Center, Rol-

For primary bibliographic entry see Field 05B. W73-06036

CHEMICAL COMPOSITION OF INTERSTI-TIAL WATERS FROM MARINE SEDIMENTS, BAFFIN BAY, Reasselaer Polytechnic Inst., Troy, N.Y. Dept. of

Geology. For primary W73-06172 ary bibliographic entry see Field 02L.

HYDROCARBON GASES PRODUCED IN A HYDROCARBON GASES PRODUCED IN A SIMULATED SWAMP ENVIRONMENT, Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center.
A. G. Kim, and L. J. Douglas.
Available from NTIS, Springfield, Va. 22151 as PB-212 633 Price \$3.00 printed copy; \$0.95 in microfiche. Bureau of Mines Report of Investigations RI 7690, 1972. 15 p, 11 fig, 5 tab, 10 ref.

Descriptors: *Gases, *Organic compounds, *Methane, *Carbon dioxide, *Swamps, Laboratory tests, Methodology, Soil microorganisms, Lig-Identifiers: *Hydrocarbon gases, Laboratory produced, Wood cellulose.

coal formation begins in peat swamps or bogs in which microorganisms alter plant material and initiate the formation of carbonaceous sediments. Methane, which constitutes about 98% of the hydrocarbon gas in coalbeds, is known to be a product of anaerobic microbial metabolism. To determine if other hydrocarbon gases could be produced in an environment similar to that of a swamp, samples of wood cellulose and lignin were inoculated with soil microorganisms and incubated anaerobically. The resultant gases included methane, ethylene, propane, propylene, butanes, pentanes, and carbon dioxide. Hydrogen was also produced from the wood samples during the first month of incubation. Over 90% of the produced gas was methane; CO2 was the other predomiant component. Concentrations of all other hydrocarbon gases ranged from 1 to 20 ppm, approximately 0.1% of the total hydrocarbons, which was less than the concentration in coalbeds. Although higher hydrocarbons could be produced in a swamp environment, subsequent mechanisms, either concentration or formation swamp environment, subsequent mechanisms, either concentration by adsorption or formation during geochemical reactions, must affect the final concentration of higher hydrocarbons in coalbeds. W73-06178 COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUISIANA: PHASE II, HYDROLOGY, Louisiana Wild Life and Fisheries Commission, New Orleans.
For primary bibliographic entry see Field 05A.
W73-06215

RAPID REACTION RATES BETWEEN WATER AND CALCAREOUS CLAY AS OBSERVED BY SPECIFIC-ION ELECTRODES, Geological Survey, Lubbock, Tex. W. W. Wood.

Journal of Research of the U.S. Geological Survey, Vol 1, No 2, p 237-241, March-April 1973. 2 fig, 1 tab, 5 ref.

Descriptors: "Water chemistry, "Ion exchange, *Chemical reactions, *Clays, *Aqueous solutions, Chemical potential, Equilibrium, Kinetics, Artifi-cial recharge, Solubility, Sodium, Salinity, Calci-um, Hydrogen ion concentration, Clay minerals, Water spreading. Identifiers: *Specific-ion electrodes.

Specific-ion electrodes were used to simultane-ously determine the activity changes of calcium, hydrogen, sodium, fluoride, and divalent ions when 50 g of a natural, untreated material contain-ing calcium-rich mixed-layer illite-montmorillonite clay, quartz sand, and calcium carbonate was added to 250 ml of water containing 220 mg/liter of added to 230 mi of water contaming 200 migrates on Na. Calcium and magnesium were displaced from the clay by the sodium; the exchanged and dis-solved calcium precipitated as calcium carbonate, and the magnesium remained in solution. Fluoride entered into both a rapid reaction and a long-term reaction, indicating solution from the material. entered into both a rapid reaction and a long-term reaction, indicating solution from the material. The pH decreased rapidly. The reactions for all ions other than fluoride were faster than the response time of their respective electrodes and were complete in less than one minute. Rapid solu-tion of material containing calcium, magnesium, sodium, and fluoride was also observed when a twillight and the south metrical was added sodium, and fluoride was also observed when a duplicate sample of the earth material was added to distilled water; pH also changed rapidly in this mixture. These results suggest that many important water-rock reactions can be considered nearly instantaneous for purposes of digital modeling of the geochemical changes suring artificial recharge. (Knapp-USGS) W73-06225

HYDRAULIC SAND-MODEL STUDIES OF MIS-CIBLE-FLUID FLOW, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 02L. W73-06226

DISTRIBUTION OF BROMINE IN BRINES AND SALT FORMATIONS OF THE GULF OF KARA-BOGAZ-GOL (RASPREDELENIYE BROMA V RASSOLAKH SOLVANVKH OBRAZOVANIYAKH ZALIVA KARA-BOGA-Z-GOL), For primary bibliographic entry see Field 05B. W73-06234

THERMAL AND MINERAL WATERS OF NON-METEORIC ORIGIN, CALIFORNIA COAST METEORIC URIGIN, CALIFORNIA CONST RANGES, Geological Survey, Menlo Park, Calif. D. E. White, I. Barnes, and J. R. O'Neil. Geological Society of America Bulletin, Vol 84, No 2, p 547-559, February 1973. 4 fig. 2 tab, 31 ref.

Descriptors: "Thermal water, "Mineral water, "California, "Water chemistry, "Connate water, Magmatic water, Hydrothermal studies, Saline water, Isotope studies, Stable isotopes, Water sources, Geothermal studies, Stable isotopes, Water Identifiers: Coast Ranges (Calif).

Field 02-WATER CYCLE

Group 2K-Chemical Processes

The numerous thermal springs of the Wilbur Springs mercury district, California, although rich in CO2, are otherwise similar in Cl content and isotopic composition to analyzed California oli-field waters. Some of the springs discharge near the tops of ridges. These relations cannot be explained by normal meteoric recharge. Water of isotopic composition similar to that of Wilbur Springs occurs in the Sulphur Bank mercury district 15 miles west of Wilbur Springs, but the Sulphur Bank water is higher in Br and NH3 and much lower in Cl than are the Wilbur and most oli-field waters. The Wilbur Springs and Sulphur Bank waters are enriched by about 4% in D and about 1.35 in 0-18 relative to local meteoric waters and thus require processes that differ from most about 1.35 in 0-18 relative to local meteoric waters and thus require processes that differ from most goothermal systems. The D enrichment, chemical composition, and ridge-top discharge are best ex-plained by large proportions of nonmeteoric water. Wilbur Springs and Sulphur Bank may be dominated, respectively, by waters of connate and metamorphic origin, derived from reaction of an-cient ocean waters and marine sediments, and now being forced out by pressures that are higher than being forced out by pressures that are nigher than hydrostatic. Many springs in the region are chemi-cally intermediate between the high- and low-chloride types and commonly mix near the surface in different proportions with local meteoric water. Many of these springs are associated with mercury deposits and Alpine serpentinites. (Knapp-USGS) W73-06225

OCCURRENCE OF SHALLOW SALTY GROUND WATER IN SELECTED AREAS OF WEST VIRGINIA,
Federal Water Quality Administration, Wheeling, W.va. For primary bibliographic entry see Field 02F. W73-06396 W.Va.

CHEMICAL ANALYSIS OF MARION COUNTY WATERWAYS FOR HARDNESS AND ACIDITY, West Virginia Univ., Morgantown. Dept. of Animal Industry and Veterinary Science. S. Knotts.

roceedings of the West Virginia Academy of cience, 1970, Vol 42, p 192-196, 1971. 1 fig, 1 tab,

Descriptors: "Water quality, "Surface waters, "Chemical analysis, "West Virginia, Hardness (Water), Hydrogen ion concentration, Acidity, Allalinity, Rivers, Streams.
Identifiers: "Marion County (W. Va.).

Water samples from 125 locations, mostly from rivers, creeks and runs in Marion County, West Virginia, were analyzed for acidity and total hard-ness. Results are tabulated and geographic trends of hardness and acidity are discussed. The hardness of water is considered to be the sum of the concentrations of all the metallic cations other than ions of the alkalies and is expressed in terms than loss of the alkatus and is expressed in terms of equivalent calcium carbonate concentration.

Nearly all of the hardness is due to calcium and magnesium ions; but in some waters, iron, aluminum, manganese, strontium, zinc, and a few other metals must be taken into consideration.

Total hardness was determined without reserved to Total hardness was determined without regard to individual ion concentrations. Total hardness of andividual ion concentrations. Total hardness of the samples varied from zero to above 800 ppm. Acidity in 125 Marion County streams varied from 2.5 to 8.6 pH with the majority falling in the 6.5-8.5 range. Only the West Fork and Monongahela Rivers and a few streams such as Coon's Run, Booth's Creek, Parker Run, Pharaoh Run, and Mod Run showed acidity less than pH 6. (Woodard-USGS)

URANIUM AND THORIUM CONCENTRA-TIONS IN WIND-BORNE SAHARAN DUST

OVER THE WESTERN EQUATORIAL NORTH ATLANTIC OCEAN, Rosenstiel School of Marine and Atmospheric

Sciences, Miami, Fla. H. S. Rydell, and J. M. Prospero. Earth and Planetary Science Letters, Vol 14, No 3, p 397-402, April, 1972, 1 tab. 32 ref.

Descriptors: *Sedimentology, *Atlantic Ocean, *Dusts, *Uranium radioisotopes, Correlation analysis, Analytical techniques, Air-water interfaces, Sampling, Radioactive dating.

Identifiers: *Nuclides, Thorium.

Relative concentrations of certain uranium and thorium nuclides are used for the absolute dating of oceanic sediments. The average uranium and thorium concentration in 15 samples of windborne Saharan dust collected at Barbados, West Indies, is 3.6 and 12.4 ppm, respectively; these values are approximately one-third greater than that of average crustal material. The thorium-uranium weight ratio of the dust is 3.5, about the same as that of the crust; the U-234/U-238 activity ratio is 1.08 and the Th-230/U-234 activity ratio 0.97. The 1.08 and the Th-230/U-234 activity ratio, 0.97. The presence of large amounts of African dust in At-lantic sediments should not significantly affect the validity of the assumptions inherent in the Pa-231/Th-230 and Th-23-/Th-232 dating methods. (Woodard0USGS)

EFFECTS OF WEATHERING ON ORGANIC MATTER IN SHALES, Atlantic Richfield Co., Dallas, Tex. For primary bibliographic entry see Field 02J. W73-06402

CALCULATION OF IONIC ACTIVITIES IN NATURAL WATERS, Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology. N. Van Breemen.

Geochimica et Cosmochimica Acta, Vol 37, No 1, p 101-107, January, 1973. 2 fig, 2 tab, 12 ref.

Descriptors: *Water chemistry, *Computer programs, *Chemical potential, Equilibrium, Hydrogen ion concentration, Chemical reactions, Oxidation-reduction potential, Ions, Aluminum, Sulfates, Calcium, Carbonates, Bicarbonates, Chlorides, Iron, Potassium, Mananese, Sodium, Silicates. Identifiers: *Ionic activities. Magnesium,

The Garrels and Thompson model for calculating the distribution of ionic activities in sea water was programed for computer treatment and extend to include 33 dissolved species. Ionic activities predicted by the model compare well with those expected on the basis of independent evidence expected on the basis of independent evidence (concerning equilibria involving gypsum, calcite, dissolved ferrous and ferric iron, and a basic alterminium sulphate) for waters with pH values between 1.8 and 8.2, and ionic strengths up to 1.0. (Knapp-USGS)

W73-06403

MIGRATION OF TRACE METALS IN SNOW. Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 05B. W73-06404

EXTRACTION AND CONCENTRATION OF OR-GANIC SOLUTES FROM WATER, Geological Survey, Denver, Colo. Resources Div.
For primary bibliographic entry see Field 07B.

2L. Estuaries

SEA WATER INTRUSION, ARTIFICIAL RECHARGE, AND SURFACE WATER-GROUND WATER RELATIONSHIPS: A GENERAL STATEMENT, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Ground-water Hydrology. For primary bibliographic entry see Field 04B. W73.09021.

SALT WATER INTRUSION IN COASTAL WELL FIELDS, North Carolina State Univ., Raleigh. A. I. Kashef. In: Proceedings of the National Symposium on Ground-Water Hydrology, p 235-258, November 1967. 5 fig, 2 tab. 16 ref.

Descriptors: *Saline water intrusion, *Saline Descriptors: "Same water intrusion, Same water freshwater interfaces, Saline water barriers, Wells, Water wells, Aquifer systems, "Artesian aquifers, Mathematical models, Mathematical studies, Laplaces equation.
Identifiers: "Coastal aquifers, Well fields, Gravity

The analogy between the free surface of gravity flow wells and the fresh-salt water interface due to pumping from an artesian aquifer is shown to hold true. Thus, in order to find the combined effects of natural flow and fresh water withdrawal by pump-ing in coastal fields, the analyses of gravity wells ing in coastal fields, the analyses of gravity wells as well as overpumped artesian wells are applied. Salt water intrusion is shown to create a serious problem in coastal well fields which necessitates sound planning and design, especially for the location, depth, and capacity of individual wells. The presented method is an attempt to find the contents of the salt water mounds due to pumping in an artesian aquifer with a certain natural flow. Several assumptions are considered necessary to an artesian aquiter with a certain hatural 1999. Several assumptions are considered necessary to find a solution for this problem, i.e., evaporation, leakage, etc., are neglected. Although the flow is governed by the Laplace equation within the fresh water medium, the principle of superposition cannot be valid due to the change of the flow domain. not be valid due to the change of the flow domain. It is suggested, therefore, to superimpose only the individual pressure heads at the upper boundary of the artesian aquifer as well as the individual areas of the pressure head diagrams due to the various effects of the natural flow and the individual wells or their images. (Smith-NWWA) W73-d5922

SEAWATER ENCROACHMENT IN HAWAIIAN

GHYBEN-HERZBERG SYSTEMS,
Hawaii Univ., Honolulu. Water Resources
Research Center.

In: Proceedings of the National Symposium on Ground-Water Hydrology, p 259-271, November 1967. 2 fig, 1 tab, 31 ref.

Descriptors: Hawaii, *Saline water intrusion, *Saline water-freshwater interfaces, Temperature, Salinity, Recharge, Wells, Water wells, Groundwater watlability, Groundwater barriers, *Groundwater recharge, Water quality, Irrigation.
Identifiers: Ghyben-Herzberg ratio, Temperature profile, Geothermal gradient.

In Hawaiian basal aquifers, fresh-water lenses occur as a result of high rainfall, high infiltration, and spillage from dike zones. These lenses have a fresh water-salt water interface as large as the surface area of the aquifer. The diverse geologic and hydrologic settings of these aquifers have created a number of unusual features in Hawaiian saltwater encroachment: the storage effects in a thick lens; temperature-depth profiles; mixing zone;

tidal efficiency; and responses to abatement. Slow response of bottom-storage in a lens and large volume of water from bottom storage available over a long period invalidate any safe yield based on short-term data. It was found that rainwater infiltrating into the soil increases in temperature through several mechanisms, among them passage through heated soil, solar heating at the top, and geothermal heating from below. Variations in chloride content with depth are expected to reflect interaction among the waters of the freshwater lens, the underlying salt water, and the surrounding ocean. It was found that when high salinities have resulted from excessive and over-concentrated drafts, the restoration of normal salinity has usually been very rapid. (Campbell-NWWA)

SOME ASPECTS OF THE GENESIS OF IRON-MANGANESE CONCRETIONS IN THE GULF OF RIGA (O NEKOTORYKH STORONAKH FORMIROVANIYA ZHELEZO-MARGAN-TSEVYKH KONKRETSIY RIZHSKOGO

ZALIVA), L. Ye Shterenberg. Akademiya Nauk SSR Doklady, Vol 201, No 2, p 457-460, 1971. 3 fig, 1 tab, 19 ref.

Descriptors: "Geochemistry, "Sedimentation, *Sediment distribution, "Sediments, "Metals, Iron, Manganese, Carbon, Carbon dioxide, Car-bonates, Sands, Diagenesia, Topography. Identifiers: "USSR, "Gulf of Riga, "Concretions.

The bottom topography of the Gulf of Riga was investigated for distribution of sediments and concretions. Iron-manganese concretions of the gulf are most likely formed by the diagenetic migration of Fe and Mn. This mechanism explains the presence of two zones of concretion formation separated by pelagic mud; the occurrence of concretions around Rukhnu Island and in zones where sands are extremely thin; and the formation of manganese carbonates in the littoral zone. Subcurface, drainsee, into the Baltic Sea which of manganese caroonates in the intoral zone. Sus-surface drainage into the Baltic Sea, which amounts to only 1.5% of total river discharge, precludes any assumed migration of iron, man-ganese, phosphorus, or other elements with groundwater. (Josefson-USGS) W73-05990

SEASONAL CHANGES IN THE MEIOFAUNA POPULATION OF AN INTERTIDAL SAND

BEACH, Marine Biological Association of the United King-dom, Plymouth (England). Lab. For primary bibliographic entry see Field 05C. W73-05997

NUTRIENTS IN THE PAMLICO RIVER ESTUA-RY, N.C., 1969-1971, North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 05C.
W73-06025

METHODS OF DETERMINING AQUIFER STORAGE CAPACITY AND FRESH-SALINE WATER INTERFACES BY GEOELECTRICAL INVESTIGATIONS, Missouri Water Resources Research Center, Rol-

For primary bibliographic entry see Field 04B. W73-06033

UNOFFICIAL COMPOSITE; GENERAL PER-MITTING PROCEDURES FOR COASTAL ZONE ACTIVITIES IN FLORIDA. Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council. For primary bibliographic entry see Field 05G. W73-06104

SEDIMENT TRANSPORT OF ESTUARY ENTRANCE SHOALS AND THE FORMATION OF SWASH PLATFORMS, Skidaway Inst. of Oceanography, Savannah, Ga. G. F. Oertel.
Journal of Sedimentary Petrology, Vol 42, No 4, p 858-863, December 1972. 6 fig. 12 ref.

Descriptors: "Sediment transport, "Intertidal areas, "Estuaries, "Waves (Water), "Bores, Shallow water, Surges, Wave pile-up, Refraction (Water waves), Sand bars, Sand spits, Shoals, Iides, Tidal effects.
Identifiers: "Swash platforms.

Identifiers: *Swash platforms.

Sand shoals which extend seaward of Georgia estuary entrances are affected by a variety of sedimentary processes. Among these the interaction of waves and tidal currents appears to be most important to the sediment budget. As waves approach the shoreline they are refracted and wrap around the shoal surfaces and result in surges of water toward the shoreline. Waves also commonly break at points of interference and create wave bores which travel shoreward and interact with tidal currents. During the ebbing tide, this interaction is of particular importance to the sediment budget of the shoals. Sediment being transported seaward by wave bores. The resultant sediment gyres are dynamic sediment traps which cause accumulations of sand in swash platforms. Swash platforms associated with shoals can be recognized by the sand-body geometry and characteristic internal structures. (Knapp-USGS)

CHEMICAL COMPOSITION OF INTERSTI-TIAL WATERS FROM MARINE SEDIMENTS, BAFFIN BAY, Rensselaer Polytechnic Inst., Troy, N.Y. Dept. of

Geology. S. A. Ali, G. M. Friedman, and A. J. Amiel

Journal of Sedimentary Petrology, Vol 42, No 4, p 794-802, December 1972. 12 fig. 1 tab, 34 ref. ONR Contract 67-A-0117-0004 ACS Grant PRF 2393-

Descriptors: *Bottom sediments, *Connate water, *Arctic, *Water chemistry, *Pore water, Mineralogy, Chlorides, Salainty, Sulfates, Calcium, Magnesium, Sodium, Potassium, Strontium, Trace elements.

Identifiers: *Baffin Bay (Canada), Rubidium,

To sample interstitial water in bottom sediments,

To sample intersitiial water in bottom sediments, seven cores from deep water were taken along the northwest-southeast axis of Baffin Bay between Greenland and the Canadian Archipelago. The sediments in the vores consist of sandy and silty muds. Chlorinity and sulfate in the intersitiial waters are similar to those of Copenhagen sea water. Apparently bacterial reduction of sulfates in pore waters does not occur. The Ca/Cl ratio in interstitial waters decreases slightly relative to Copenhagen sea water, whereas the trend for the Md/Cl ratio increases. Increase in magnesium is related to its release by chlorite, which is abundant in the Baffin Bay sediments. Values for the Na/Cl and K/Cl ratios in the interstitial waters cluster about those for Copenhagen sea water. The Sr/Cl about those for Copenhagen sea water. The Sr/Cl ratio of interstitial waters tends to decrease relaratio of interstitial waters tends to decrease relative to Copenhagen sea water. The Rb/Cl ratio is higher in interstitial water than in normal sea water. The expected parallelism between the changes in the K/Cl and Rb/Cl ratios is not apparent. Despite some exceptions, the Li/Cl ratio in interstitial waters increases relative to sea water. (Knapp-USGS)
W73-06172

A MATHEMATICAL MODEL FOR THE PRE-DICTION OF UNSTEADY SALINITY INTRU-SION IN ESTUARIES, Massachusetts Inst. of Tech., Cambridge.

M.L. Thatcher, and D. R. F. Harleman. Available from NTIS, Springfield, Va 22151 as COM-72-10670 Price \$3.00 printed copy; \$0.95 in microfiche. Sea Grant Project Report No MTTSG 72-7, February 25, 1972. 232 p, 79 fig, 10 tab, 61

Descriptors: "Saline water intrusion, "Estuaries, "Mathematical models, "Sea water, "Tidal effects, Momeatum transfer, Salinity, Forecasting, Analytical techniques, Unsteady flow, Dispersion, Steady flow, Saline water-freshwater interfaces, Mixing, Hydrologic data, Equations.

Mixing, Hydrologic data, Equations.

A predictive numerical model of unsteady salinity intrusion in esturaies was derived by formulating the problem in finite-difference terms using the one-dimensional, tidal time, variable area equations for the conservation of water mass, conservation of momentum and conservation of salt-Tidal time means a time scale of calculation larger than that defining turbulence, but much smaller than a tidal period in order to correctly represent the tidal advection within a tidal period. The tidal dynamic equations are coupled to the conservation of salt equation through a salinity-density relationship, and the ocean boundary condition for salt is formulated from the direction of flow at the entrance to the estuary. The mathematical model has been verified using data from the Waterways Experiment Station salinity flume and field data from the Delaware, Potomac, and Hudson Rivers. By specifying initial conditions, fresh water hydrographs, and tidal elevations at the ocean, it is possible to predict the time-varying salinity using this model. (Woodard-USGS)

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUI-SIANA: PHASE II, HYDROLOGY, Louisiana Wild Life and Fisheries Commission, New Orleans. For primary bibliographic entry see Field 05A. W73-06215

HYDRAULIC SAND-MODEL STUDIES OF MIS-CIBLE-FLUID FLOW, Geological Survey, Lakewood, Colo. J. M. Cahill.

J. M. Cahill. Journal of Research of the U.S. Geological Survey, Vol 1, No 2, p 243-250, March-April 1973. 8 fig, 1 tab, 9 ref.

Descriptors: *Hydraulic models, *Groundwater movement, *Saline water movement, *Saline water intrusion, *Path of pollutants, *Saline water-freshwater interfaces, Encroachment, Hydraulic similitude, Mass transfer, Ion transport, Hydrogeology, Translocation.

Hydraulic sand models are useful physical tools in the investigation of the transition zone that occurs between salt and fresh groundwater in coastal aquifers. Such models are used to demonstrate the effects of transport mechanisms that influence the dynamic behavior and the shape of the transition zone. The techniques employed in obtaining in-place measurements of solute concentrations are generally the stumbling block in generating data for two-dimensional dispersion systems. Two in-place measurement techniques were used in the studies described: (1) conductivity probes when salt was used as a tracer; and (2) photoelectric cells when organic dye was used as a tracer. Results indicate that conductivity methods are more reliable; however, care must be exercised in-asmuch as the probes tend to disturb the fluid flow. (Knapp-USGS) Hydraulic sand models are useful physical tools in

FLUVIAL AND ESTUARINE SEDIMENTS EX-POSED ALONG THE OUDE MAAS (THE NETHERLANDS), San Diego State Coll., Calif. Dept. of Geography. J. L. Van Beek, and E. A. Koster.

Sedimentology, Vol 19, No 3-4, p 237-256, December 1972. 12 fig, 34 ref.

Descriptors: "Sedimentary structures, "Estuaries, "Coasts, "Stratigraphy, "Tidal effects, Erosion, Sedimentation, Geomorphology, Alluvium, Tidal waters, Deposition (Sediments). Identifiers: "Oude Maas (The Netherlands).

Identifiers: *Oude Maas (The Netherlands).

Sedimentary structures in recent alluvium in The Netherlands that was deposited in an environment transitional between fluvial and estuarine have three units, that vary according to type and association of sedimentary structures, and lithology. The lower unit is characterized by large-scale trough cross-stratification. Sedimentary structures suggest a fluvial environment in which water and sediment movement were unidirectional but subject to periodic fluctuations. The middle unit displays an alternation of small- and large-scale cross-stratification, which is directionally bimodal due to tidal action. Both water and sediment movement were be-directional and highly variable in intensity. A vertical gradation in dimension of structures shows successive weakening of tidal currents as deposition proceeded. The upper unit is characterized by flaser and lenticular bedding and small-scale trough cross-stratification, ascribed to an estuarine regime of low intensity. The transition from a fluvial to an estuarine environment is related to increased tidal action, caused by the destruction of large parts of reclaimed land bordering the Oude Maas, following severe floods in this area during the 14th and 15th centuries, A.D. (Knapp-USGS)

THE INFLUENCE OF SEASONAL BAINFALL AND WATER TEMPERATURE ON THE POPULATION OF MERCIERELLA ENIGMATICA FAUVEL (ANNELDAL-POLYCHAETA) IN THE BOSS RIVER ESTUARY, NORTH QUEEN-

RUSS RIVER ESTUARY, NORTH QUE SLAND, University Coll. of Townsville (Australia). For primary bibliographic entry see Field 05C. W73-0626.

EFFECTS OF ESTUARINE DREDGING OF TOXAPHENE-CONTAMINATED SEDIMENTS IN TERRY CREEK, BRUNSWICK, GA. - 1971, Georgia Univ., Sapelo Island. Marine Inst. For primary bibliographic entry see Field 05C. W73-06278

RADIOECOLOGY OF ZN-65 IN ALDER SLOUGH, AN ARM OF THE COLUMBIA RIVER ESTUARY, Oregon State Univ., Corvallis. Dept. of Oceanography. For primary bibliographic entry see Field 05B. W73-06283

THE BIOCHEMICAL ANALYSIS OF SOME ESTUARINE PHYTOPLANKTON SPECIES. I. FATTY ACID COMPOSITION, Oregon State Univ., Corvallis. Dept. of Botany and Plant Pathology.
For primary bibliographic entry see Field 05A. W73-06289

INSTRUMENTATION FOR A RADIOECOLOGI-CAL STUDY OF THE HUMBOLDT BAY MARINE ENVIRONMENT, California Univ., Livermore. Lawrence Liver-more Lab.

For primary bibliographic entry see Field 05B. W73-06295

MANOMETRIC ASSESSMENT OF INTERSTI-TIAL MICROALGAE PRODUCTION IN TWO ESTUARINE SEDIMENTS, Oregon State Univ., Corvallis. Dept. of Botany. For primary bibliographic entry see Field 05C.

W73-06319

CYCLING OF ELEMENTS IN ESTUARIES, National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center. For primary bibliographic entry see Field 05C. W73-06327

CHEMICAL SURVEY OF THE TAMAR ESTUA-RY. I. PROPERTIES OF THE WATERS, Marine Biological Association of the United King-dom, Plymouth (England). For primary bibliographic entry see Field 05C. W75-0534

A DESCRIPTION OF THE EPRE HYDRODYNAMICAL-NUMERICAL MODEL, Naval Postgraduate School, Monterey, Calif.
T. Laevastu, and K. Rabe.
Available from the National Technical Information Service as AD-745 759, \$3.00 in paper copy, \$9.95 in microfiche. ENVPREDRSCHFAC Technical Paper No 3-72, March 1972. 49 p, 12 fig. 16 ref.

Descriptors: "Hydrodynamics, "Oceanography, Analysis, "Computer programs, Tides, Storm surge, Oil, Pollutants, Dispersion, Diffusion, Ocean currents, Winds, Boats, Atmospheric pressure, Oceans, Bays, Estuaries, Coasts, Systems analysis, Mathematical models, Model studies. Identifiers: "Prediction, "Pinite difference forms, "Open boundaries, Computation, Search and rescue.

An operational description is provided of the Environmental Prediction Research Facility's single-layer Hydrodynamical-Numerical (H-N) model that has been used for a variety of local oceanographic analyses and predictions. The model is an adaptation of the one formulated by Walter Hansen, University of Hamburg, who developed and tested his over two decades. The description includes the setting-up of the model for a given area and the selection and preparation of input data. A brief background of the hydrodynamical formulas and their finite difference forms is given. Latest additions to the model are documented, such as diffusion and transport computations, and treatment of open boundaries: The model is best suited to shallow semiclosed bays and estuaries but can also be used with three open boundaries for any coastal area; two different applications of this feature are described. Another new feature makes possible the inclusion of the permanent (thermohaline component) current as well as tidal and wind currents. The model has been used for analysis and prediction of tides, storm surges, current, diffusion and transport of pollutants and oil, and drift of boats for search and rescue purposes. The computer program is written in FORTRAN II. (See also W73-06356) (Bell-Cornell)

APPENDICES TO A DESCRIPTION OF THE EPRF HYDRODYNAMICAL-NUMERICAL EPRF MODEL Naval Postgraduate School, Monterey, Calif.

Available from the National Technical Informa-tion Service as AD-745 760, \$3.00 in paper copy, \$0.95 in microfiche. ENVPREDRSCHFAC Technical Paper No 3A-72, March 1972. 30 p, 3 ap-

Descriptors: "Computer program, "Parametric hydrology, "Hydrodynamics, "Oceanography, "Analytis, Tides, Storm surge, Pollutants, Oil, Dispersion, Diffusion, Ocean currents, Winds, Boats, Atmospheric pressure, Oceans, Bayas, Estuaries, Coasts, Systems analysis, Mathematical models. Identifiers: "Prediction, "Finite difference forms, "Open boundaries, Computation, Search and

This report comprises the appendices to EPRF Technical Paper 3-72 entitled 'A Description of the EPRF Hydrodynamical-Numerical Model,' published under separate cover. The appendices are as follows: (A) Input Parameters, Formats and Set-up of Tapes; (B) Abbreviations and Parameters Used in the Program; and (C) The Program for the Hydrodynamical-Numerical Model in Fortran II. The model has been used for the analysis and prediction of tides, storm surges, currents, diffrict of boats for search and rescue purposes. The model, which is an adaptation of the one formulated by Walter Hansen, University of Hamburg, is best suited to shallow semiclosed bays and estuaries but can also be used with three open boundaries, another new feature makes possible the inclusion of the permanent (thermohaline component) current as well as tidal and wind currents. Additional features are diffusion and transport computations. (See also W73-06355) (Bell-Cornell) W73-06356

ON FLOW IN ESTUARIES, Technical Univ. of Denmark, Copenhagen. H. Rasmussen, and J. B. Hinwood. La Houille Blanche, No 5, p 377-407, 1972. 2 fig, 2 tab, 21 ref, 2 append.

Descriptors: "Estuaries, "Mixing, "Stratification, "Mathematical studies, Saline water, Freshwater interfaces, Tides, Model studies, Coastal plains, Fluid mechanics, Flow characteristics, Density, Viscosity, Velocity, Shear stress.

In a two part study of the flow of coastal plain estuaries, critical analyses of a model developed by Pritchard and its simplification by Rattray and Hansen are given, and a model of an estuary with slightly stratified turbulent flow is discussed. The Pritchard model is found to be a satisfactory basis for further studies provided that certain assumptions of mixing due to tidal notion, shear stress and wind stress are satisfied. The Rattray and Hansen model, which is based on Pritchard's, is not considered to be as reliable because of further assumptions which were made on critical parameters. In the second part of the study a critical review of estuary flow is given to show how basic conditions cannot all be simultaneously satisfied. Although valid models can be produced for particular reaches, they cannot be expanded to pertain to the entire estuary. (Jerome-Vanderbilt) W73-06367

THE USE OF A SIMPLE MATHEMATICAL MODEL TO ACCOUNT FOR THE VARIATION OF COLIFORM DENSITY, SALINITY AND TEMPERATURE WITH TIDAL STATE, Dundee Univ. (Scotland). Dept. of Civil Engineer-For primary bibliographic entry see Field 05B. W73-06379

CHARACTERIZATION OF GELBSTOFFE IN MONTEREY BAY BY NYLON ADSORPTION, UV, AND PAPER CHROMATOGRAPHY, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 05B. W73-06388

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HOLLOW FIBER TECHNOLOGY FOR AD-VANCED WASTE TREATMENT, Monsanto Research Corp., Durham, N.C. For primary bibliographic entry see Field 05D. W73-06039

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Saline Water Conversion—Group 3A

STYRENE PLANT WASTE HEAT UTILIZA-TION IN A WATER DESALINATION PROCESS, Badger Co., Inc., Cambridge, Mass. (assignee). R. E. Hughes. U. S. Patent No. 3,691,020, 4 p., 2 fig., 10 ref; Offi-cial Gazette of the United States Patent Office, Vol. 902, No. 2, p. 626, September 12, 1972.

Descriptors: "Patents, "Desalination, "Demineralization, "Distillation, "Industrial wastes, "Chemical wastes, Evaporation, Condensation, Salt water, Brackish water, Waste water treatment, Liquid wastes, Abatement, Pollution abatement, Water quality.

Identifiers: "Waste heat utilization, Dehydrogena-

A water desalination system comprises a flash evaporator in the cooling water loop of a styrene unit. The cooling water is pumped through coolers and condensers in the styrene unit to the tubes of the evaporator where it is used as the condensing medium for flashed water vapor which becomes the distilled water product. The low level waste heat recovered from the dehydrogenation reactor is cooled and condensed. The unvaporized portion of the cooling water is passed back to its source or passed to a cooling tower where any remaining heat absorbed in its passage through the coolers and condensers of the styrene unit is dissipated. (Sinha-OEIIS)

PERMEATION SEPARATION ELEMENT, Du Pont de Nemours (E. I.) and Co., Wilmington, Del. (assignee). P. R. McCinnia, and G. J. O'Brien. U. S. Patent No. 3,690,465, 10 p, 14 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 2, p. 504, September 12, 1972.

Descriptors: "Patents, "Reverse osmosis, "Desalination, Permeability, "Membranes, Permeability, "Membranes, Permeability, "Membranes, Permeability, "Membranes, Permeability, "Membranes, Permeability, Sea water, Equipment, "Polymers, Separation techniques."

An element is provided for the selective permeation separation of components of fluid mixtures with particular usefulness in reverse osmosis for desalination purposes. The element consists of thin layers of parallel hollow filaments separated by thin foraminous materials and a resinous tube sheet structure encapsulating a portion of the holow filaments. The hollow filaments are made of a polymeric material. Each filament has an outside diameter between 10 and 250 microns, a wall thickness between 2 and 75 microns and an open end. The open end of the filaments extend through the tube sheet structure. (Sinha-OEIS)

FLASH DISTILLING APPARATUS WITH BUFFER PLATES ARRANGEMENT, Hitachi Ltd., Hitachi City (Japan). (assignee).

N. Satone. U. S. Patent No. 3,689,366, 4 p, 8 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 1, p. 251, September 5, 1972.

Descriptors: *Patents, *Flash distillation, *Evaporation, Equipment, Water treatment, *Water purification, *Desalination.

High and low pressures and temperature dif-ferences are used in this apparatus. To decrease the degree of superheat of a stock solution, agita-tions are imparted to it thereby promoting evaporation. The difference in sensible heat result-ing from a pressure difference between flash chamber compartments can be effectively utilized for evaporation. Buffer plates are mounted on the bottom surface and arranged in rows extending transverse to the direction of flow. The buffer plates agitate the flowing stock solution so that

upper and lower layers of the solution change place and evaporation is further promoted. It is thus possible to decrease the degree of superheat in the flash chamber without causing flow re-sistance. (Sinha-OEIS) W73-06148

WATER TREATMENT APPARATUS, For primary bibliographic entry see Field 05D. W73-06146

WATER TREATMENT PROCESSES, Weir Water Treatment Ltd., Cathcart (Scotland). (assignee). For primary bibliographic entry see Field 05D. W73-06150

DISTILLATION APPARATUS, Albright and Wilson Ltd., Olbury (England). (assignee). K. E. Porter, S. R. M. Ellis, N. Ashton, and C. H. G. Hands. U. S. Patent No. 3,687,818, 4 p. 6 fig, 1 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 901, No 5, p 1769, August 29, 1972.

Descriptors: *Patents, *Distillation, Equipment, *Water treatment, Desalination.
Identifiers: Packing material.

A novel packing material for distillation columns is suitable for use in distillation at subatmospheric pressure. The packing material comprises double plates, each double plate consisting of two expanded metal sheets attached to each other back to back with the strand junctions of each centrally overlying the orifices of the other and the strands of each aheet which project outwards from the median plane of the double plate being located below the orifice bounded by the strand. The double plates may be criss-crossed and interlocking or corrugated to form vertical tubular ducts. (Sinha-OEIS)

ELECTRODIALYSIS DEMINERALIZATION APPARATUS, CCI Aerospace Corp., Van Nuys, Calif. (as-

signec).
A. M. Johnson, and R. F. Gilman.
U. S. Patent No. 3,697,410, 3 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 609, October 10, 1972.

Descriptors: *Patents, *Electrodialysis, Ion exchange, *Permeable membranes, Electrodes, *Demineralization, *Desalination, Equipment, Pollution abatement, Water quality control, Water pollution control, Membranes, Salt water, Sea water, Brackish water, Separation techniques.

An ion permeable membrane is placed adjacent to a blotter with a spacer material being located adjacent to the membrane. A second ion permeable membrane may be located on the opposite side of the blotter. If two such membranes are used, one would be of the cation type, the other the anion type. The spacer has apertures to permit free flow of water through it. The combination of spacer, blotter, and membrane or membranes is then wound about an inner electrode. The final configuration results in a spiral cross sectional arrangement. An annular outer electrode is placed about the exterior surface. A DC potential is applied between the electrodes with the potential being reversible. (Sinha-OEIS)

DISTILLATION APPARATUS AND METHOD, Aerojet-General Corp., El Monte, Calif. (asU. S. Patent No. 3,697,385, 3 p, 1 fig. 5 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 603, October 10, 1972.

Descriptors: "Patents, "Distillation, evaporation, "Condensation, Sea water, "Desalination, Equipment, Saline water, Brackish water, Water quality, Water quality control, Separation techniques."

This apparatus has a series of flash evaporation stages, condenser tubes associated with the stages through which distilland passes as a condensing medium. There is a special heater for heating the distilland after it emerges from the condenser tubes, and a pump for circulating the distilland. A turbine receives heated distilland prior to flash of the distilland. The turbine serves to reduce distilland pressure prior to introduction of the distilland into the first distillation stage, and to produce the mechanical energy required by the apparatus. (Sinha-OEIS) mechanica ha-OEIS)

FEEDWATER HEATER AND STRAINER ARRANGEMENT FOR MULTIPLE-EFFECT THIN FILM DESALINATION PLANT, General Electric Co., West Lynn, Mass. (as-

General and Control of the Control of the Control of the Control of the United States Patent Office, Vol 903, No 2, p 603, October 10, 1972.

Descriptors: "Patents, "Desalination, "Condensa-tion, Thin films, Equipment, "Evaporation, Mem-branes, "Distillation, Salt water, Sea water, Brackish water, Water treatment, Water purifica-

Feed water heater loops are disposed in con-densing chambers of successive vertical tube evaporator effects and connected in series flow relationship. Feed water supply lines are con-nected between successive heaters and lead to the respective feedwater manifolds via in-line strainers equipped with blow-down valves. (Sinha-OEIS) W73-06423

METHOD OF AND APPARATUS FOR THE MULTI-FLASH DISTILLATION OF LIQUIDS, National Research Development Corp., London (England), (assignee).

A. Porteous.

N. S. Patent No. 3,697,382, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 603, October 10, 1972.

Descriptors: *Patents, *Distillation, *Flash distil-Descriptors: "Patents, "Distantion," I man circulation, "Heat exchangers, Equipment, Sea water, Saline water, Brackish water, Water purification, Water treatment, Water quality, Water quality control, "Heat pumps, "Desalination, Separation

Flash distillation is carried out in at least four chambers in series. The residence time of the liquid in passing through each of at least two of the flash chambers is so controlled that not more than 97% equilibration is obtained. In the preceding chamber the percentage of equilibration is mar-97% equilibration is obtained. In the preceding chamber the percentage of equilibration is marginally less than the percentage of equilibration in the following two or more chambers to initiate the operating percentage of equilibration in the succeeding chambers. This ensures an increase in the temperature difference between the liquid and the flashed vapor. Heaters and flash chambers are connected in series and pressure is reduced in successive chambers. (Sinha-OEIS) W73-06424

METHOD FOR PRODUCING PURE WATER PROM SEA WATER AND OTHER SOLUTIONS

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

BY FLASH VAPORIZATION AND CONDENSA-

TION,
D. F. Othmer.
U.S. Patent No. 3,692,634, 19 p, 12 fig, 14 ref; Official Gazette of the United States Patent Office, Vol 902, No 3, p 1053, September 19, 1972.

Descriptors: "Patents, "Desalination, Sea water, "Waste water treatment, Sewage treatment, Sludge treatment, "Pulp wastes, Water treatment, Evaporation, "Condensation, Flash distillation. Identifiers: Chemical treatment.

A method is provided of conducting a physical or chemical process at a high temperature with or in a solution such as sea water, waste pulp liquors, and sewage and sludges. Then multi-stage flash evaporation of part of the water cools it, while heat of condensation of the vapors from the MSF preheats the solution itself. (Sinha-OEIS) W73-06437

EQUILIBRIUM AND KINETICS FOR THE CAR-BONATION OF MAGNESIUM HYDROXIDE

SLURRIES, Aerojet-General Corp., El Monte, Calif. R. W. Lawrence. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, Price \$0.40. Office of Saline Water Research and Development Progress Report 754, December 1971. 14-30-2589.

Descriptors: Calcium, *Seawater, *Softening, *Magnesium hydroxide, *Magnesium carbonate, *Reactions, Equilibrium, *Distillation, Desalination, *Solubility, *Carbonates. Identifiers: *Carbonation.

A study with the objective of improving the yield in the lime-magnesium carbonate softening process for seawater was conducted. Removal of calcium from seawater by such a process will allow improvement in the economy of distillation by operation at increased brine temperatures without calcium sulfate scale formation. A technical difficulty at the San Diego LMC plant has been the poor yield of magnesium carbonate trihydrate made by the reaction of magnesium to the poor yield of magnesium carbonate trihydrate made by the reaction of magnesium hydroxide and carbon dioxide in a carbonation tower. This program was to determine the causes of the poor utilization and to recommend methods to obtain improved conversions. Laboratory studies showed that the equilibrium solubility of magnesium carbonate in seawater at 77 F is nearly the same as in distilled water. The solubility of magnesium carbonate increases rapidly with higher concentrations of carbon dioxide. The solution consists almost entirely of magnesium bicarbonate but the solid in equilibrium with the solution is MgCO3. 3H2O. The solubility at a given partial pressure of carbon dioxide in the gas, decreases with increasing temperature. Kinetic studies in a laboratory column showed that fresh magnesium hydroxide should be employed in the lime-magnesium carbonate process and that a liquid-filled column should be field tested. An apparatus based on a stirred reactor appears to be an attractive alternate to a packed tower because of the high rates of carbonation obtainable with agitation. (OSW Abstract) W73-06446 stract) W73-06446

HYDROLYSIS LOSSES IN THE HYDRATE FROCESS FOR DESALINATION: RATE MEASUREMENT AND ECONOMIC ANALYSIS, Syracuse Univ., N.Y. Dept. of Chemical Engineering and Materials Science.

S. L. Colten, F. S. Lin, T. C. Tsao, S. A. Stern, and A. J. Barduhn.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.70. Office of Saline Water Research and Development Progress Report No. 733, February 1972. 72 p, 12 tab, 40 fig, 20 ref. 14-01-0001-1455.

Descriptors: *Desalination processes, *Hydrate processes, Hydrolysis, Hydrates, Hydration, Costs.

Costs. Identifiers: Freon-31, F-31, CH2CIF, Freon-142b, F-142b, CH3CCIF2, F-21, CHC12F, Methyl bro-mide, CH3Br, Methyl chloride, CH3Cl, F-12, CC12F2.

CC12F2.

The agents used in the Hydrate Process for desalination very slowly decompose by hydrolysis in water and the rate at which this occurs has been measured for the four hydrating agents CH2CIF (F-31), CH2CIF (F-12), CH3CCIF2 (F-142) and CH3Br. Data are available in the literature on the two additional agents CC12F2 (F-12) and CH3CI, and the hydrolysis rates of all six agents are subjected to economic analysis to determine the cost to the process of the lost agent. The result shows that methyl bromide (CH3Br) is not suitable for use in a commercial hydrate process because the cost of the lost CH3Br would be at least 10 cents per 1000 gallons of water produced. Methyl chloride is a borderline case, but the four agents CH2CIF (F-31), CHC12F (F-21), CH3CCIF2 (F-142b) and CC12F2 (F-12) are all acceptable for use, from the standpoint of their hydrolysis rates. The cost of agent loss for these last four agents ranges from 0.001 to 0.2 cents per 1000 gallons of water produced. (OSW Abstract)

ION METABOLISON IN HALOPHILIC ORGAN-

ISMS,
Hebrew Univ., Jerusalem (Israel).
B. Z. Ginzburg, and M. Ginzburg.
For sale by the Superintendent of Documents,
U.S. Government Printing Office, Washington,
D.C. 20402, Price \$1.00. Office of Saline Water
Research and Development Progress. Report No
751, January 1972. 96 p., 20 fig. 9 tab, 37 ref. 14-010001-521.

Descriptors: "Biological membranes, "Desalina-tion, "Ion transport, "Membranes, "Saline water, Permselective membranes, Perbeability, Bacteria. Identifiers: "Ion metabolism, "Halophilic organ-isms, Chloroplasts cell membranes, "Dead Sea bacteria, Israel.

For a long time it has been considered a mystery as to how living organisms manage to tolerate salt concentrations as high as those found in the Dead Sea. It was thought that their mechanisms for regulating the salts of the cell interior must be very powerful and that a study of these mechanisms might advance knowledge of biological desalination. The study described has demonstrated a completely new and highly powerful system for salt-regulation, capable of controlling the concentation of sodium chloride from 0.4 to 4 Molar (2.4%-24% salt). The system found in Halobacterium has not so far been described anywhere else in the plant or animal kingdom. Both the Halobacterium species and D. parva have been found to be highly permeable to the hydrogen ion and to the ions of the alkali metals. Halobacterium cells are even permeable to large organic molecules including starch. Thus the cells of these organisms are not surrounded by any functional membrane and differ in this respect from the cells of other known species. It appears that the mechanism for salt control in Halobacterium lies in the structure of the cell proteins and in the form taken by potassium within the cell. Changes in either of these 2 parameters lead to changes in the concentration of cell sodium. Thus the site of control is within the cell interior, rather than in the cell membrane, as is the case in other organisms. (OSW Abstract)

REMOVAL OF ORGANIC COLLOIDS BY MICROFLOTATION, Clarkson Coll. of Technology, Potsdam, N.Y. For primary bibliographic entry see Field 05D. W73-06449

HUMIC ACID REMOVAL BY MICROFLOTA-TION AND GRAVITY SETTLING, Clarkson Coll. of Technology, Potsdam, N.Y. For primary bibliographic entry see Field 05D. W73-06450

THE MICROFLOTATION OF SILICA, Clarkson Coll. of Technology, Potsdam, N.Y. For primary bibliographic entry see Field 05D. W73-06451

STABILITY OF COLLOIDAL SILICA. IV. THE SILICA-ALUMINA SYSTEM, Clarkson Coll. of Technology, Potsdam, N.Y. For primary bibliographic entry see Field 05D. W73-06452

3B. Water Yield Improvement

GEOTHERMAL RESOURCE INVESTIGA-TIONS, Bureau of Reclamation, Boulder City, Nev. Region 3. L. R. Porter.

Meeting Preprint No 1875, American Society of Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 29 p, 24 fig.

Descriptors: "Water resources development, "Geothermal studies, "Water supply, "Artesian wells, "Thermal power, California, Desalination, Colorado River Basin, Colorado River Compact, Colorado River, Water demand, Hydrothermal studies.

The heavy use of the waters of the Colorado River will greatly expand in the future. Already the Colorado River compact allocates more water for consumptive use by the seven basin states than runoff records of the past few decades shows is available. Continued use of water for agricultural demands, worsened by increasing population and additional demands for Colorado River water, requires augumentation of water resources. A promising source is desalted water from the geothermal resources in California's Imperial Valley. Besides providing upward of 2.5 million acrefect of high quality water annually, the use of geothermal resources could add up to 10 million acrefect of high quality water annually, the use of geothermal resources could add up to 10 million schowatts of electrical energy to the Pacific-Southwest power systems. Preliminary investigations show that several billion acrefect of hot brine exist in the Imperial Valley geothermal field and when tapped by a deep well will turn into a mixture of steam and hot brine water. The steam can be used to power turbines as well as be converted into water. The hot brine can be demineralized for the mineral by-products as well as providing fresh water, or could be reinjected into the geothermal region. The Bureau of Reclamation is developing this program in three stages: (1) limited-scale demonstration, and (3) large-scale production. (Poertner) W73-05943

CHANGING ROLE OF WATER CONVEYANCE

CHANGERS AND STATEMS,
COLORAD State Univ., Fort Collins.
G. V. Skogerboe, and A.M. Walker.
Meeting Preprint No 1880, American Society of
Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29February 2, 1973. 16 p, 5 ref.

Descriptors: "Irrigation canals, "Water conveyance, "Irrigation practices, "Water supply, "Land management, "Water pollution control, Irrigation, California, Farm management, Water demand, Colorado River, Colorado River compact, Water distribution (Applied), Waste water (Irrigation), Irrigation water, Water quality.

Increased demand for water resources in the fu-ture will demand improved water management practices. Problems will include not only supplying more volume of water, but also providing for im-proved levels of water quality. Especially signific-cant will be the demand for irrigation water hot only must the available quantity of irrigation water be increased but it must be upgraded because the water becomes seriously degraded as it leaches through the soil and returns to the water shed. An example of this type of degradation is the Colorado River Basin, the waters of which are highly saline near the mouth. The situation is exexample of this type of degradation is the Colorado River Basin, the waters of which are highly saline near the mouth. The situation is expected to become worse with the development or water resource development projects in future years. Improvement of water quality from irrigation will evolve from improvement of all three sectors of the total irrigation system: (1) water delivery, (2) the farm, and (3) water removal. The water delivery system can be improved by proper maintenance and operation programs such as canal lining, or using closed conduits. Use of high quality water will reduce the level of pollution contained in the irrigation return flow. Flow measurement to individual farms is necessary to insure that all farms share in the water provided. Better farm management policies, including soil erosion control and use of tile drains will help improve the water quality after it is used for irrigation. There exist many institutional problems associated with farm irrigation such as allocation of water distribution system improvement costs and justification of the water demands. Necessary arrangements for these problems must be solved for a meaningful program. (Poertner)

TURNING THE TIDE AGAINST AQUATIC WELDS.
For primary bibliographic entry see Field 04A.

ON THE EVAPORATION FROM A LAKE IN WARM AND DRY ENVIRONMENT, Bonn Univ. (West Germany). Inst. of Meteorolo-For primary bibliographic entry see Field 02D. W73-06366

3C. Use of Water of Impaired Quality

THE QUALITY OF GROUND WATER IN RELA-TION TO IRRIGATION AGRICULTURE IN NORTHWESTERN NEW SOUTH WALES, AUS-NORTHWESTERN NEW SOUTH WALES, AUSTRALIA, University of New England, Armidale (Australia). J. J. Pigram. International Commission on Irrigation an Drainage Bulletin, p 21-30, July, 1972. 6 fig, 3 tab.

Descriptors: "Irrigation, "Salinity, Dissolved solids, Water quality, Groundwater, "Alluvial aquifers, Alkali soils, "Australia, Saline water intrusion, Evapotranspiration, Agriculture, Geologic units, Lake beds, Intermittent streams."

The presence of ground water in quantities adequate for irrigation use has been demonstrated in many of the valleys of westward-flowing rivers in New South Wales and has permitted the intensive utilization of the alluvial plains over extensive areas away from surface streams. However, in some respects the quality of the ground water gives cause for concern. The continued use of poor quality irrigation water has caused soluble aslits to build up through the process of evapotranspiration, eventually leading to high soil salinity levels. Two characteristics total salinity status and residual alkali were held to be the most significant for crops and soil. In the region studied, from only 39 percent of the irrigation wells sampled could the water be classified as suitable for

use (less than 1000 ppm t.d.s.). The distribution of zones of poor quality water was found to be closely related to the geology of the region. Especially in areas of Permian rocks, which were deposited under marine or brackish conditions, was the salinity of groundwater found to be excessive. Also contributing to the accumulation of salts in the groundwater are the high evaporation rates and prevalence of interior drainage in the region. (Smith-NWWA) W73-05908

REVEGETATION AUGMENTATION BY REUSE OF TREATED ACTIVE SURFACE MINE DRAINAGE - FEASIBILITY STUDY, NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div. For primary bibliographic entry see Field 05D. W73-06209

OBSERVATIONS ON SOME SALINE LOWLAND RICE FIELDS OF CAMARINES

LOWLAND RICE FIELDS OF CAMARINES SUR, Philippines Univ., Diliman, Quezon City. Dept. of Agricultural Botany. B. T. Mercado, C. A. Malabayabas, P. B. Escuro, R. Obias, and C. Escober.

R. Obias, and C. Escober.
Philipp Agric. Vol 54, No. 7/8, p 338-344. 1970/71.
Illus.
Identifiers: *Camarines Sur, Rice fields,
Lowlands, *Saline soils.

The electrical conductivity (EC) of the saline fields surveyed (Baybay, Sto. Domingo, Casuray and Cabusao) ranged from 2.72 to 6.35 mmhos./cm. as compared to 0.91 to 1.63 mmhos./cm. of the non-saline areas of Handong, San Isidro and Maalsom. The brackish water used to irrigate the saline fields showed an EC of 4.45 mmhos, while the water of the Bicol river used to irrigate the San Isidro field gave EC values of 0.18 and 1.16 mmhos./cm., respectively. The chemical analysis of the soil and irrigation water also revealed that the predominant ions were Na and Cl, with Ca and Mg tending to be higher also in the saline soils.—Copyright 1972, Biological Abstracts, Inc. W73-06294

SALT ACCUMULATION IN A SANDY SOIL UNDER SPRINKLER IRRIGATION, ITS INFLUENCE ON APRICOT TREE HEALTH AND ITS REMOVAL BY LEACHING, Adelaide Dept. of Agriculture (Australia). Adelaide I M. R. Till.

Exp Rec Dep Agric South Aust. 5. p 40-51. 1970. Il-

Identifiers: *Irrigation effects, *Saline water, *Fruit crops, Accumulation, Apricot-3, Chlorides, Health, Irrigation, Leaching, Salts, Sandy soli, Sodium, Soils, Sprinkler irrigation, Toxicity,

In an apricot orchard the lateral and vertical distribution of salts in the soil was determined within the area bounded by 4 fixed overhead sprinklers. A positive relation was found between the amount of irrigation water applied and the depth at which salts had accumulated in the soil. This salt accumulation resulted in symptoms of Na and chloride toxicity in adjacent trees. A single leaching irrigation of 15 cm resulted in the removal of 50% of the salts where the accumulation was greatest. No more removal of salt was obtained by the application of 30 cm of water in 1 irrigation.—Copyright 1972, Biological Abstracts, Inc.
W73-06297

USE OF MINERALIZED WATER BY KALAHARI WILDLIFE AND ITS EFFECTS ON HABITATS,
G. Chile, R. Parris, and E. LeRiche.
East Afr Wildl J. 9: p 125-142. 1971. Illus.
Identifiers: Gemsbok, Habitats, Hartebeest,
*Kalahari, *Mineralized water, Sheep, Springbok,
Vegetation, Waterholes, Wildebeest, *Wildlife.

This study surveyed the use made by springbok, hartebeest, wildebeest and gemsbok, in particular, of mineralized artificial waterholes along the Nossob river in the southern Kalahari and the effects of this use on the delicate surrounding habitats, as a basis for evaluating the uses and limitations of such water in the management of these species. Taking into account the chemical composition of the dissolved salts in the water; the status of the vegetation and conservation trends near water holes; the relative use made of the waterholes by the antelopes; and land use history, the following conclusions were made. The animals made regular use of the water, some of which was more mineralized than that recommended for domestic stock, including sheep; there was no relationship between the total dissolved salts and animal use, although there may have been some association between gemsbok use and certain ions; wildlife altracted to boreholes had very little effect on the stability of some surrounding habitats, but may have retarded recovery in areas downgraded by past land use, and under these circumstances the effects of this land use were still amply evident after 2 1/2 decades. From this and other evidence, it is suggested that, at the present level of knowledge, mobile wildebeest populations can be stabilized by the provision of relatively potable water, and mineralized water may be used to raise the levels of springbok, hartebeest and gemsbok to pulsations. However, as the water is less of a limiting factor than for species requiring regular drinking water, the increase in density may be relatively limited and so less of a danger to the maintenance of surrounding habitats.—Copyright 1972, Biological Abstracts, Inc.

W73-06381

3D. Conservation in Domestic and Municipal Use

A SOCIOLOGICAL PERSPECTIVE OF WATER CONSUMERS IN SOUTH FLORIDA HOUSEHOLDS. Rosearch Center.

For james ville. Water Resour
Research Center.

For primary bibliographic entry see Field 06D.

W73-06019 Gainesville. Water Resources

A PLAN FOR WATER-SEWER DEVELOPMENT IN THE LAKE-PORTER REGION, INDIANA. Lake-Porter Regional Transportation and Planning Commission, Highland, Ind. For primary bibliographic entry see Field 08B. W73-06077

TWENTY YEAR WATER AND SEWERAGE PLAN, Capital Region Planning Commission, Baton Rouge, La. R. P. Adams

Community Facilities Report No 1A, August 1971, 66 p, 31 fig. HUD 701 grant.

Descriptors: "Water supply, "Water supply development, "Comprehensive planning, "Sewerage, 'Future planning (Projected), Facilities, Water quality standards, Water demand, Wastewater treatment, Priorities, Cost analysis, Water policy, Land subsidence, Reservoirs, Groundwater recharge, Aquifer management, Land use, Land development, Financing, Budgeting, Louisiana. Identifiers: *Baton Rouge (Louisiana), Implementation priorities. Policy.

This study attempts to produce a comprehensive overview of sewerage and water needs in the Capital Region for the next twenty year period. An inventory of existing facilities, a summary of water quality standards, projected demands for water supply and wastewater treatment, implementation priorities, and cost figures for executing necessary improvements are presented. Several

Field 03-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3D—Conservation in Domestic and Municipal Use

recommendations are made as well. (1) Policy and programs should be instituted now to control pumpage to forestall soil subsidence and construct reservoirs for both direct supply and aquifer recharging. (2) Each community should give water distribution a high priority in their capital budgeting and insure that future land use decisions are based in part, on their shifting accepted to ing and insure that future land use decisions are based, in part, on their ability to provide this ser-vice. (3) Each constituency should marshal its resources for prompt compliance with the state law requiring a minimum of secondary sewage treatment. Future land use should also be pre-dicted on the availability of this service. (Davis-Chicago) W73-06079

A REPORT FOR H.U.D. CERTIFICATION FOR WATER AND SEWER FUNCTIONAL PLANNING AND PROGRAMMING FOR THE URBAN PORTION OF THE WACCAMAW DISTRICT OF SOUTH CAROLINA. Waccamaw Regional Planning and Development Council, Georgetowa, S.C. For primary bibliographic entry see Field 06B. W73-06080

METROPOLITAN DEVELOPMENT GUIDE, SANITARY SEWERS, POLICIES, SYSTEM PLAN, PROGRAM. Metropolitan Council of the Twin Cities, Minn. For primary bibliographic entry see Field 05D. W73-06083

ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020 - VOL. 1 TEXT, VOL. 2. AFFENDURES.
Hazen and Sawyer, New York.
For primary bibliographic entry see Field 06D.
W73-06080

AN APPROACH TO A NEW CITY: PALM COAST,
ITT Community Development Corp., New York. N. Young, and S. Dea. Environmental Affairs, Vol 2, No 1, p 127-153, Spring 1972. 1 fig, 16 ref.

Descriptors: *City planning, Research and development, *Future planning (Projected), *Land development, *Environment, *Quality control, Conservation, Preservation, Feasibility studies, Coordination, Management, Comprehensive planning, Social aspects, *Plorida. Identifiers: *Palm Coast (Flordia).

Reflecting a concern for environmental quality, the future city of Palm Coast (Florida) has committed major efforts toward the preservation and enhancement of the balance of nature in the planning and development of a future city for 750,000 people. The principal issue involved is whether it is possible to have environmental quality and development as complementary, parallel objectives. Many significant studies and action programs initiated at the inception of the project have been carried out to establish the feasibility of environmental controls on development. The studies have examined: waste water treatment and disposal; improved waste water collection; wastes dies have examined: waste water treatment and disposal; improved waste water collection; wastes from watercraft; pollutants in drainage and stormwater runoff; casal design for maximum water quality; operation and maintenance of canals to perpetuate water quality and aesthetics; sampling and monitoring of canal water quality; preservation of intracoastal waterway water quality; solid waste disposal; maintenance of general environmental quality; beach and sand dune preservation; tree preservation; species preservation; preservation of natural areas; and air pollution control. For the Palm Coast developers, planning is a pragmatic combination of researcher into what has worked auccessfully in other communities. Included among the planning guidelines of Palm Coast are:

(1) provision of choices for residents in a diversity of living environments, (2) coordinated project programs for orderly development, (3) program management of resources, (4) policy making for implementation of comprehensive plans, and (5) identification of values of social significance. (See also W73-06093) (Strachan-Chicago)

ENVIRONMENTAL AND ECONOMIC IMPACT OF RAPID GROWTH ON A RURAL AREA: PALM COAST, Southeastern Environmental Services, Jackson-

Environmental Affairs, Vol 2, No 1, p 154-171, Spring 1972. 2 fig, 55 ref.

Descriptors: *Planning, *Environment, Economics, *Land development, *Evaluation, Quality control, Taxes, Saline water intrusion, Canals, Trees, Preservation, Mosquitos, Highways, Schools (Education), Future planning (Projected), *Florida. Identifiers: *Palm Coast (Florida), *Flagler Consty (Fla), Subdivision regulations.

Plans for the Palm Coast Development in Flagler County, Florida have not received sufficient critical examination by the County officials. Arguments counter those presented by authors Young and Dea in their article, 'An Approach to a New City: Palm Coast' (Environmental Affairs, Vol. 2, No. 1, Spring 1972). Flagler County lacks the technical and environmental experts necessary to gather and interpret vital information, thereby, giving ITT, the developer, unlimited power in its city planning. Various degrees of misinformation among citizens and officials were discovered with respect to the effect of the development on: taxes. among citizens and officials were discovered with respect to the effect of the development on: taxes, salt water intrusion, dead end canals, tree preservation, mosquito control, highway construction, schools, and subdivision regulations. The author was unable to obtain data through direct communication with representatives of ITT, and as a result was compelled to gather information. Letters and phone calls to the developers did not produce any of the information promised for use in the article. The commissioning of a Special Task Force of prominent Florida environmental leaders to advise officials of Flagler County, and to save the natural beauty of this area is recommended. (See also W73-06092) (Strachan-Chicago) W73-06093

PREPARING OURSELVES FOR THE CITY OF TOMORROW,
Doxiadis Associates, Athens (Greece).
For primary bibliographic entry see Field 06B.
W73-06094

THE REGIONAL WATER SUPPLY AND WATER POLLUTION CONTROL PLANS.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.
For primary bibliographic entry see Field 06B.

URBAN WATER MANAGEMENT, National Water Commission, Arlington, Va. Engineering and Environmental Sciences Div. V. A. Koelzer.

Journal of the American Water Works Association, Vol 64, No 9, p 537-544, September, 1972. 2

Descriptors: "Water management (Applied), *Economies of scale, *Economic efficiency, Financing, Water supply, Water pollution control, Flood control, Recreation, Wildlife, Parks. Identifiers: "Urban water management, *Area-wide management, Integration.

Six areas define the functional problem of urban water management: (1) municipal water supply, (2) pollution control, (3) flood control and drainage, (4) recreation, (5) flish and wildlife, and (6) parks and open space. Out of these problems emerges the ultimate problem, the imposition of large demands for capital expenditures by all metropolitan entities. Perhaps the most effective method for coping with these problems is through integrated area-wide water management. Area-wide water management means unifying the direction of the activities of a single water function, such as water supply, waste water treatment, parks, and open space, throughout all or several municipalities of a metropolitan area. It offers such advantages as economies of scale, improvements in efficiency and reliability, better coordination, and better overall use of water resources. Integrated water management means unifying the planning, decision making, implementation, and operation of two or more of the different water functions, and also offers such advantages as economies of scale and improved coordination. The benefits from area-wide and integrated water management appear to outweigh whatever costs are associated with such management. (Settle-Wisconsin)

INDUSTRY EXPENDITURES FOR WATER POLLUTION ABATEMENT, National Industrial Conference Board, New York. For primary bibliographic entry see Field 05G. W73-06481

A NEW APPROACH TO DETERMINING THE PRICE ELASTICITY OF DEMAND FOR DOMESTIC WATER, Clemson Univ., S.C.
For primary bibliographic entry see Field 06D.
W73-06483

WATER AND SEWERAGE FACILITIES PLAN FOR THE GREATER COLUMBIA AREA. Central Midlands Regional Planning Council, Columbia, S.C. For primary bibliographic entry see Field 05D. W73-06487

REGIONAL WATER AND SEWER GUIDE. Upper Savannah Planning and Development Dis-trict, Greenwood, S.C. For primary bibliographic entry see Field 05D. W73-06488

THE ST. LOUIS REGION WATER AND SEWERAGE FACILITIES,
East-West Gateway Coordinating Council, St. Louis, Mo. For primary bibliographic entry see Field 05D. W73-06491

COMPREHENSIVE SEWER AND WATER PLAN, Mid Columbia Economic Development District The Dalles, Oreg. For primary bibliographic entry see Field 06B. W73-06492

WATER AND WASTEWATER FUNCTIONAL PLANNING REPORT, FY 1972
South Carolina Appalachian Council of Governments, Greenville.
For primary bibliographic entry see Field 05D.
W73-06493

SEWERAGE AND WATER SUPPLY PLAN FOR LACKAWANNA COUNTY. Lackawanna County Regional Planning Commis-sion, Scranton, Pa. For primary bibliographic entry see Field 05D.

W73-06494

VOLUME IV-INVENTORY AND ANALYSIS OF EXISTING WATER SUPPLY SYSTEMS AND POTENTIAL SOURCES OF SUPPLY.
Malcolm Pirnie, Inc., White Plains, N.Y.

Report prepared for the Valley Regional Planning Agency, Ansonia, Connecticut, February 1970, 31 p, 4 fig, 6 tab, 2 append.

Descriptors: "Water supply, "Water supply development, Population, Pacilities, Water utilization, "Connecticut.
Identifiers: "Ansoma (Conn), "Regional water

supply, Water supply systems.

This is the fourth of a five-volume series of reports prepared to serve as part of the basis for an area-wide water/sewer plan and program for the Valley Region. This volume includes an inventory and evaluation of the major water supply systems and potential sources of supply existing or being developed to serve the Valley Region. The study area includes areas in the adjacent communities and commisses approximately 13 sources will a supply source with the supply state of the supply server will be supply as the supply server will be supply supply the supply area includes areas in the adjacent communities and comprises approximately 91 square miles, of which about 58 are in the Valley Region. Present population of the Valley Region is estimated at 67,800. The inventory includes a delineation of present water service areas and major facilities. Estimates were made of domestic, commercial, and industrial water usage in the Valley Region and potential water supply sources and aspects of regional water supply were considered. (Davis - Chicago) W73-06495

WATER RESOURCES IN THE TAMPA RAV DE.

GION. Briley, Wild and Associates, Daytona Beach, Fla.

Prepared for the Tampa Bay Regional Planning Council, St. Petersburg, Florida, April, 1970. 193 p, 19 fig, 14 tab, 27 ref, 4 append.

Descriptors: "Water resources development, "Management, "Florida, "Water supply, "Water supply development, "Water sources, Projections, Water requirements, Water conservation, Water Allocation (Policy), Water storage, Storm runoff, Water reuse, Recycling, Waste water disposal, Groundwater.

Identifiers: *Tampa Bay, Underground water storage, Alternate water sources.

ded are an inventory of the Tampa Bay Reincluded are an inventory of the Tampa Bay Region's 'stall water resource; estimates of future
water use requirements; recommendations for a
continuing program for the development of alternative and supplemental water sources; and a
recommended plan in the conservation, development and management of the region's water
resource. The salient features of the recommended
has included alterative of the recommended resource. In a same treatures of the recommender plan include: allocation of knawn supplies among the users of the Region; development of un-derground water storage in both the surficial soils and in portions of the underlying limestones; salvage of storm runoff; development of beneficial uses for domestic waste waters; and maximum utilization of surface-water sources based upon the development of these sources as the primary water supply and development of groundwater as a supplementary source. (Davis-Chicago) W73-06499

COMPREHENSIVE WATER AND SEWER PLAN, SHREVEPORT STANDARD METROPOLITAN STATISTICAL AREA, CAD-DO-BOSSIER PARISHES, LOUISLANA. Demopolus and Ferguson, Inc., Shreveport, La. For primary bibliographic entry see Field 05D. W73-06500

3E. Conservation in Industry

ENERGY: THE SQUEEZE BEGINS, For primary bibliographic entry see Field 05G. W73-06370

THE COST OF POLLUTION ABATEMENT IN AMERICAN INDUSTRY, Environmental Protection Agency, Washington,

For primar W73-06485 nary bibliographic entry see Field 05G.

3F. Conservation in Agriculture

CHANGING ROLE OF WATER CONVEYANCE

SYSTEMS, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 03B. W73-05946

EFFECTS OF VARIOUS IRRIGATION REGIMES ON YIELD AND QUALITY OF IRRIGATION POTATOES.

Department of Primary Industrictralia).
A. S. Greasley, and C. J. Lather. artment of Primary Industries, Brisbane (Aus-

Queensl J Agric Anim Sci. Vol 28, No. 4, p 181-

189. 1971. Illus. Identifiers: *Irrigation, *Potatoes-D, Specific-Gravity, Tubers, Crop yield.

Yields increased with increasing amounts of irriga-tion (up to 2 in. or more of water applied/wk), with the optimum yields usually occurring at about 1-1 1/2 in./wk average. Combination of frequency and amount did not seem to be important. The specific gravity of the tubers declined with increased irrigation amount, and was influenced partly by the frequency and amount of combinations used.— Copyright 1972, Biological Abstracts, Inc. W73-06064

MICROBIOLOGICAL QUALITY OF SUBSUR-FACE DRAINAGE WATER FROM IRRIGATED AGRICULTURAL LAND, Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. For primary bibliographic entry see Field 05B. W73-06070

USE OF WATER BY SUGARCANE IN HAWAII UNE OF WATER BY SUGARCANE IN HAWAII MEASURED BY HYDRAULIC LYSIMETERS, Hawaii Univ., Honolulu. Water Resources Research Center.

P. C. Ekern.

In: Proceedings of 14th Congress, International Society of Sugarcane Technologists, 1972, p 803-812, 3 fig. 3 tab, 17 ref. OWRR-A-017-HI (4). 14-31-0001-3211.

Descriptors: "Sugarcane, "Consumptive use, Evapotranspiration, Lysimeters, Sprinkler, Irriga-tion, Radiation, Evaporation pans, Hawaii. Identifiers: Drip irrigation.

Consumption of water by sprinkler and drip irrigated surgarcane was measured in Hawaii by hydraulic load cell lysimeters. One-eye cane transplants of variety H 50-7209 were set in a 5 x 5-ft plants or variety H 30-7209 were set in a 5 x 3-st grid under flat bed culture in Molokai latosol. Water use by full canopy sprinkler irrgiated ap-proximated that from a conventional class A pan. The water use often equalled or exceeded full net radiation for both pan evaporation and cane evapotranspiration, indicative of positive advec-tion of heat. The fraction of sunlight coverted into net radiation had a strong seasonal change from 0.53 in summer to 0.38 in winter for cane and from 0.63 in summer to 0.47 in winter for pan. The patterns of water use closely reflected this seasonal change in net radiation. W73-6c25

PLANT WATER STATUS OF APPLE TREES AND ITS MEASUREMENT IN THE FIELD: VIL WEEK-TO-WEEK VARIATIONS IN THE EARLY MORNING PLANT WATER STATUS OF THREE VARIETIES, Department of Primary Industries, Applethorpe (Australia). Granite Belt Horticulture Research Stations

Statuon. K. R. Chapman. Queensl J Agric Anim Sci. Vol 28, No 4, p 203-210.

Queens J Agric Anim Sci. Vol.26, No.4, p. 203-210. 1971. Illus. Identifiers: *Plant physiology, *Moisture stress, Fruit crops, Ossite investigations, Apple-d, Australia, Measurements, Plants, Trees, Variations, Varieties, Moraing.

Varieties, Moraing.

Leaf water potential, fruit water potential and leaf infiltration scores were used as indices of the plant water status of 3 apple cultivars, during 1 growing season. The highest and lowest leaf water potentials recorded, during the early morning period, were: 'Delicious,' -9 atm and -20 atm; 'Jonathan,' -3.5 atm and -19 atm; and 'Granny Smith,' -4 and -13 atm. Mean fruit water potential was similar for 'Granny Smith and 'Delicious,' but considerably lower for 'Jonathan.' Leaf infiltration scores and leaf water potential maintained a close relationship, while leaf and fruit water potentials showed considerable divergence. These data serve to show the magnitude of plant water stress which apple trees have to contend with in an almost normal growing season in Queensland (Australia).—Copyright 1972, Biological Abstracts, Inc.

W73-06336

WATER PENETRATION OF VINEYARD SOILS AS MODIFIED BY CULTURAL PRACTICES, California Univ., Parlier. San Josquin Valley Agricultural Research and Extension Center. For primary bibliographic entry see Field 02G. W73-06339

IRRIGATION DEVELOPMENT AND AGRICUL-TURAL ABUNDANCE: CONFLICTING ELE-MENTS IN PUBLIC POLICY TOWARD AGRICULTURE,

Colorado State Univ., Fort Collins.

R. A. Young. Looking Ahead, Vol 19, No 7, p 2-4, October, 1971.13 ref.

Descriptors: "Reclamation, "Irrigation, "Cost-benefit analysis, "Economic efficiency, Direct benefits, Direct costs, Indirect benefits, Indirect costs, Expenditures, Economic feasibility. Identifiers: Public projects.

The costs and benefits of the federal reclamation program are evaluated and compared. The direct benefits of public irrigation projects equal the net additional value which accrues to the direct users of an increment to the water supply. Estimates of direct water value vary from \$6 per acre-foot in Central Arizona to \$18 in the High Plains of Texas. Estimates of the direct costs of irrigation range upwards from \$50 per acre-foot. Consequently, net indirect benefits or the value of non-economic factors must be substantial in order to justify the irrors must be substantial in order to justify the irtors must be substantial in order to justify the irrigation programs. Indirect benefits are thos accruing to firms who buy from and sell to the original ing to firms who buy from and sell to the original water user. Normally, indirect benefits are ignored, but in the case of a region facing economic decline in the absence of reclamation, some legitimate indirect benefits can be claimed. Estimates of these benefits usually range from \$5 to \$10 per acre-foot. There are also some indirect costs associated with reclamation projects if agricultural production elsewhere in the nation is

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Group 3F-Conservation in Agriculture

displaced by crops grown on the reclaimed land. These costs average \$20 per acre-foot. Comparison of these costs and benefits suggests that public expenditure on reclamation is economically wasteful. (Settle-Wisconsin)

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the

HYDRODYNAMIC INTERACTION OF THER-MAL STRATIFICATION AND RESERVOIR WATER QUALITY, Stone and Webster Engineering Corp., Boston, Mass.

For primary bibliographic entry see Field 05C. W73-05936

LINK BETWEEN STOCHASTIC ANI PARAMETRIC HYDROLOGY, Pittsburgh Univ., Pa. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-05964

LANDFORMS, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D. C. For primary bibliographic entry see Field 07C.

NATURAL LAND SLOPES, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 67C. W73-6597.

MAP SHOWING WATERCOURSES AND AREAS INUNDATED BY HISTORIC FLOODS IN THE MORRISON QUADRANGLE, JEFFER-SON COUNTY, COLORADO, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-05978

RIVER BASIN FRAMEWORK STUDY, SOURIS-RED-RAINY REGION, MOORHEAD, MIN-NESOTA. Souris-Red-Rainy River Basins Commission, Moorhead, Minn.

Moorhead, Minn. For primary bibliographic entry see Field 06B. W73-05979

HYDROLOGIC CONDITIONS DURING 1971 IN DADE COUNTY, FLORIDA, Geological Survey, Tallahasee, Fla. For primary bibliographic entry see Field 02A. W73-03980

PREDICTING PEAK FLOW OF SMALL WATERSHEDS BY USE OF CHANNEL CHARACTERISTICS, Minneapolis. Water Resources Research Center.
For primary bibliographic entry see Field 02E. W73-06027

REGIONAL WATER AND SEWER PLAN (1971--1972). Ark-Tex Council of Governments, Texarkana, Tex. For primary bibliographic entry see Field 06B. W73-06081 HYDROLOGIC SIMULATION: NORTH BRANCH OF THE CHICAGO RIVER. Northeastern Illinois Planning Commission, Chicago. For primary bibliographic entry see Field 02E. W73-06085

SAFETY OF DAMS. For primary bibliographic entry see Field 06E. W73-06113

PLANNING AND EVALUATION OF MULTIPLE PURPOSE WATER RESOURCE PROJECTS IN A MULTIOBJECTIVE ENVIRONMENT: AN OVERVIEW AND POST AUDIT ANALYSIS, INTASA, Inc., Menlo Park, Calif. For primary bibliographic entry see Field 06B. W73-06191

PLANT PATHOGENS AS BIOCONTROLS OF AQUATIC WEEDS, Florida Univ., Gainesville. Dept. of Plant Pathology. For primary bibliographic entry see Field 05C. W73-06206

ESTIMATING LOW-FLOW CHARAC-TERISTICS OF STREAMS IN SOUTHEASTERN MASSACHUSETTS FROM MAPS OF GROUND-WATER AVAILABILITY, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 02E. W73-06222

FLOW CHARACTERISTICS OF GEORGIA STREAMS, SUMMARIES OF FLOW DURA-TION AND OF LOW AND HIGH FLOWS AT GAGING STATIONS, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 07C. W73-06227

THE RATIONAL METHOD OF FLOOD ESTI-MATION FOR NEW SOUTH WALES, New South Wales Univ., Sydney (Australia). School of Civil Engineering. R. French, E. M. Laurenson, D. H. Pilgrim, and W. C. Boughton. Water Research Foundation of Australia Bulletin No 19, November 1971. 51 p, 14 fig, 36 ref, 3 apneed.

Descriptors: "Peak discharge, "Streamflow, "Rational formula, "Forecasting, "Rainfall-runoff relationships, Floods, Small watersheds, Mathematical studies, Equations, Runoff coefficient, Evaluation. Identifiers: "New South Wales area (Australia), Ungaged catchments.

Ungaged catchments.

Early investigators devised many formulas, mainly empirical, in their searches for a method of determining peak discharge rates from small ungaged catchments. A list is reproduced to illustrate some of these formulas. The Rational Method is a development from many of these methods and includes measurement of catchment area 'A'; estimation of time of concentration for the catchment; determination of the maximum rainfall intensity 'p' for the locality and corresponding to the time of concentration; estimation of the runoff coefficient 'C' for the catchment; and calculation of the discharge rate 'q' by the formula - q ±C.p.A. Although the Rational Method is a poor model for determining the runoff from any individual storm event, it appears to be satisfactory for use as a statistical design procedure. On this basis, the coefficient of runoff is derived and used as the ratio of flood discharge of a given return period to rainfall intensity of the same return period. Flood flow distributions were calculated from streamflow records on a number

of catchments in New South Wales, Australia, and compared with rainfall intensity distributions. The statistical runoff coefficient for a given catchment is much the same over a wide range of return periods, and an average value can be used for all return periods without sacrificing accuracy. (Woodard-USGS)
W73-06230

ALLOMETRIC GROWTH: A USEFUL CON-CEPT IN GEOMORPHOLOGY, Colorado State Univ., Fort Collins. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-06250

AQUATIC PLANT CONTROL PROGRAM STATE OF TEXAS, (DRAFT ENVIRONMEN-TAL STATEMENT). Army Eagineer District, Galveston, Tex.

Available from the National Technical Information Service as PB-204 849-D, \$3.00 in paper copy, \$0.95 in microfiche. October 1971. 16 p, 2 fig.

Descriptors: "Aquatic weed control, "Texas, "Water hyacinth, "Alligatorweed, Biocontrol, Chemcontrol, Potable water, Spraying, Herbicides, 2-4-D, Water pollution control. Identifiers: Aerial application, Agasicles flea beetle, "Environmental impact statement.

tle, "Environmental impact statement.

A draft of a cooperative program between the Pederal government and local interests for control and progressive eradication of water hyacinth and alligatorweed in the major river basins and coastal drainage areas of Texas is presented. Water hyacinth will be controlled and eradicated by spraying 2,4-D from boats, land, and by aircraft Biological control, in the form of the Agasicles flea beetle, will be the principal method used to regulate alligatorweed infestations. Butoxyethanol ester of 2,4-D or other approved chemicals will be used in potable water sources at a dosage to preclude chemical concentrations to exceed 0.1 ppm. Aerial application will be confined to areas involving little risk to crops or other desirable vegetation and will use a more concentrated formulation in an invert emulsion or similar carrier to prevent drift. Following the sequence of established priorities, treatment will begin with the most upstream infestations and progress downstream, minimizing the reinfestation of cleared reaches. The benefit-to-cost ratio for the proposed work is 9.4 based on 1971 price data. By treating the body of water in sections at different times, the biological motile species will be able to avoid oxygen depleted areas caused by decomposition of destroyed plants. (Auen-Wisconsin) W73-06315

TURNING THE TIDE AGAINST AQUATIC WEEDS.

World Farming, Vol 14, No 9, p 18-22, 1972, 5 fig, 7 ref.

Descriptors: "Aquatic weed control, Water hyacinth, Vectors (Biological), Chemcontrol, Mechanical control, Biocontrol, Cattails, Chara, Cladophora, Harvesting, Fish, Pondweeds, Alligatorweed, Algae, Plant diseases. Identifiers: Water lettuce, Salvinia, Duckweed, Coontails, Elodea, Najas, Cladophora, Nitella, Spirogyra, Eurasion watermilloil, Alligatorweed flea beetie, Phycitid stem borer, Aquatic moths, White amur, Water milfoil, Hornwart, Reeds, Rushes.

Aquatic weeds cause irrigation water loss, deplete oxygen supply, provide habitats for human disease vectors, and interfere with fishing, navigation, and recreation. Currently, chemicals are the main defense against these weeds, and some herbicides

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Control of Water on the Surface—Group 4A

have proved reasonably effective and economical in aquatic weed control. The oldest method of aquatic weed control has been mechanical removal; recently barge-type underwater mowing machines cut submerged plants and hoisted them aboard via conveyor units. Biological methods hold the greatest promises of effective and economical control without harming the environment. Insects that feed naturally on aquatic weeds, alike the alligatorweed flea beetle, are sought; a number of South American insects show an appetite for water hyacinth and certain Leplioptera species feed on Eurasion watermilfoil. Several fungi and bacteria with good pathogenic potential on water hyacinth and hydrilla have been found; the advantage of plant pathogens as control agents is that those that attack specific plants do not cause disease of man and animals. A balance could be established between aquatic weed populations and disease agents, creating a self-maintaining control system. Another biological weapon is the white amur (the Chinese or grass carp) which feeds voraciously on various weeds. (Jones-Wisconsin) Wisconsin) W73-06333

DISTRIBUTION SYSTEM ANALYSIS BY DIGITAL COMPUTER, Howard Humphreys and Sons, Cons. Engrs., England. Humphreys (Howard) and Sons, Reading (England).

(Engined).

J. D. Williams, and T. Pestkowski.

Journal of the Institution of Water Engineers, Vol.
26, No 7, p 381-391, October 1972. 3 fig. 2 tab, 8 ref.

Descriptors: "Digital computers, "Computers programs, "Distribution systems, Analysis, Performance, "Planning, "Cost analysis, Water supply, Water demand, Hydraulics, Analog computers, Simulation analysis, Systems analysis, Mathematical models. Identifiers: "Minimum cost improvements, Extensions, Distribution mains, San Jose, "Costa Rica.

sions, Distribution mains, San Jose, "Costa Rica. A comprehensive digital computer program used to analyze the performance of several large distribution systems and to plan improvements and extensions is presented. The advantages of this program over the use of analogue computers are discussed. The field procedures involved in verifying and testing existing systems, and in modelling their hydraulic performance, are described. Recent studies of the metropolitan area of San Jose and Costa Rica are quoted as an example; the use of the model in designing extensions and improvements is described. Also described in DIANA, a suite of programs capable of handling large systems. These investigations are shown to be economically feasible, for their costs are modest in relation to the benefits received through obtaining the resulting best performance from an existing system, and in relation to the assurance that improvements achieve their purpose at minimum cost. (Bell-Cornell)

COMPUTERIZED PLANNING OF THE LEAST COST WATER DISTRIBUTION NETWORK,

Water Planning for Israel Ltd., Tel-Aviv. E. Kally. Water and Sewage Works, Vol 119, No 8, p R-121 to R-127, August 1972. 4 fig, 1 tab, 3 equ.

Descriptors: "Water supply, "Distribution systems, "Networks, "Linear programming, "Optimization, "Computer programs, Pipelines, Planning, Pressure head, Flow, Wells, Systems analysis, Mathematical models.
Identifiers: "Hardy Cross method, Tree-like net-

An optimization method is presented that enables the engineer to obtain rapidly, with the aid of an electronic computer, the design for the least-cost

water distribution network meeting all the requirements specified by him. The method, which is equally applicable to tree-like and to looped network layouts, is based on a combination of two techniques: (1) Computation of hydraulic data of the network by the Hardy Cross method; and (2) the use of linear programming to find the optimum solution for a water supply network. An example problem is considered that assumes the existence of a water supply network composed of pipes of given lengths and diameters. The flows entering the network and their pressure heads are known, as well as the supplies drawn from various points in the network. The problem to solve is the degree of flow through every pipe in the system and the in the network. In protoien to solve is the degree of flow through every pipe in the system and the pressure head at every junction. The method used is based on the maxim that in a pipe network for which the configuration and required supply are fixed, the pressure head at every pipe junction is a function of the heads at the network inflows and of the pipe diameters in the network. (Bell-Cornell) W73-06354

EFFECTS OF SOIL MOISTURE STRESS ON FOLIAR NUTRIENTS OF LOBLOLLY PINE, Illinois Univ., Urbana.

A. R. Gilmore.

Trans III State Acad Sci. Vol 64, No 4, p 313-316.

Identifiers: *Foliar nutrients, *Loblolly pine, Nutrients, Pine-G, Pinus-Taeda-G, *Soil moisture,

Loblolly pine (Pinus taeda L.) seedlings were subjected to 3 soil moisture stresses during their second growing season. Foliar N was higher and foliar K, Ca and Mg were lower in those seedlings grown in the drier treatment. Foliar P was not affected by soil moisture stress.—Copyright 1972, Biological Abstracts, Inc. W73-06372

USE OF MINERALIZED WATER BY KALAHARI WILDLIFE AND ITS EFFECTS ON

For primary bibliographic entry see Field 03C. W73-06381

WATER-RESOURCES INVENTORY, SPRING 1966 TO SPRING 1971, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA,

Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 07C. W73-06390

WAVE REFLECTION AND TRANSMISSION AT PERMEABLE BREAKWATERS, Massachusetts Inst. of Tech., Cambridge. Ralph M. Parsons Lab. for Water Resources and Hydrodynamics.
For primary bibliographic entry see Field 08B.
W73-06392

NATURAL RESOURCE INFORMATION SYSTEM, DESIGN ANALYSIS. Boeing Computer Services, Inc., Seattle, Wash. For primary bibliographic entry see Field 07C. W73-06393

REPLY, (TO COMMENTS ON ANALYSIS OF STOCHASTIC HYDROLOGIC SYSTEMS), Illinois Univ., Urbana. Dept. of Civil Engineeri For primary bibliographic entry see Field 02A. W73-06406

LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN 3. DIRECT CAP-

CITY DETERMINATION AND INTRASEASONAL CONSTRAINTS, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. J. Eastman, and C. ReVelle. Water Resources Research, Vol 9, No 1, p 29-42, February, 1973. 7 tab, 36 equ, 6 ref.

Descriptors: *Linear programming, *Multi-purpose reservoirs, *Reservoir operation, *Reservoir design, *Storage capacity, *Water supply, Stochastic processes, Optimization, Recreation, Flood control, Seasonal, Monthly. Identifiers: Chance-constrained programing, Intraseasonal constraints.

A probabilistic model for multipurpose reservoir operation is reviewed and extended. The model minimizes required capacity subject to chance constraints for water supply, recreation, and flood control. The model uses a linear decision rule by which a commitment, based on the present storage, is made for the coming period. The structure of this linear programming formulation provides a direct solution in the special case where as much water as possible is reliably committed, a reasonable case for water supply. The structure of the model requires an adequate degree of continuity. This requirement generally restricts the usefulness of the model to multipurpose reservoirs a decision period water will be released, the model is extended to include constraints on storage within a decision period. Increasing the length of a decision period. Increasing the length of a decision extended to include constraints on storage within a decision period. Increasing the length of a decision period is seen to produce a large increase in reservoir capacity due to the making of commitments for a longer future of uncertain inflows. Numerical examples are provided that demonstrate the increased capacity required in a seasonal model over that required in a monthly model and the effect of using intraseasonal constraints. (Bell-Cornell) W73-06443

SEQUENCING OF INTERDEPENDENT HYDROELECTRIC PROJECTS, California Univ., Los Angeles. Graduate School of Management. D. Erlenkotter. Water Resources Research, Vol 9, No 1, p 21-27, February, 1973, 1 fig, 3 tab, 17 ref.

Descriptors: "River basin development, "Hydroelectric power, "Project planning, "Dynamic programming, Evaluation, Benefits, Multiple-purpose projects, Pacific Northwest U.S., Reservoir storage, Upstream, Storage capacity, Downstream, Systems analysis, Mathematical models, Optimization, Economics. Identifiers: "Sequescing, "Interdependent projects, River run projects, Army Corps of Engineers, Power requirements, Discounted costs.

A dynamic programing approach for sequencing interdependent projects has been developed in complete detail. Herein, a dynamic programing model is formulated for the development of the hydroelectric potential of a river basin, with the objective being the minimization of discounted costs for meeting a nondecreasing demand projection for prime power. Hydroelectric projects along the same waterway tend to be highly interdependent since upstream storage capacity creates technological external economies for downstream sites. These interdependencies are accommodated within the model, and application to the sequencing of projects in a planning situation for a particular river basin demonstrates that these interdependencies do not increase significantly the difficulty of analysis. Possible extensions of the method are discussed. (Bell-Cornell)

FINANCING STORM DRAINAGE IMPROVE-MENTS, Beck (R. W.) and Associates, Denver, Colo. For primary bibliographic entry see Field 06C.

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control of Water on the Surface

W73-06453

FLOW SIMULATION SYSTEM,
Metropolitan Sanitary District of Greater Chicago,

III.
R. F. Lanyon, and J. P. Jackson.
Paper presented at American Society of Civil Engineers Hydraulics Conference, Ithaca, New
York, August 17, 1972. 34 p. 23 fig.

Descriptors: *Simulation analysis, *Flood control, *Hydrologic systems, *Storm runoff, *Computer models, *Watershed management, Combined sewers, Water pollution control, Urban hydrology, Urban runoff, Flow profiles, Rainfall-runoff relationships, Flood Meteorological data.

Identifiers: *Chicago (III), *Flow simulation

A computer-based flow simulation system was developed to meet the need for a simple, accurate and flexible method of analyzing stormwater rumoff phenomena. Useful for both streams and sewers, the program uses watershed, meteorological and run-control data. Watershed data include numerical descriptions of the physical drainage system. Meteorological data include temperature, wind velocity, precipitation and gage location. Run-control data control input and output from the computer program. The program is thoroughly described with sample output. Accuracy has been acceptable for the Chicago area. The Flow Simulation System has provided the Metropolitan Sanitary District of Greater Chicago with the tool it needed to simulate the responses of watersheds to various changes, such as increased development and man-made alterations in the drainage system. The results of various test runs of the Flow Simulation System, have demonstrated the program's ability to reproduce past flood events and serve as justification for using the System in the analysis and design of flood control works by the Metropolitan Sanitary District. The question of transferability from watershed to watershed is a prime consideration in evaluating hydrologic models. The system was proven to meet the test of transferability in the Chicago testing were arrived at without modification of the programming or the constants involved. It is believed that the system would transfer satisfactorily to watersheds in other parts of the country with possible alteration of the programming or the constants involved. It is believed that the system of the country with possible alteration of the program in the chicago testing were arrived at without modification of the programming or the constants involved. It is believed that the system of the program is the chicago testing were acceptant being the call the control of the countrant being the call of the call of the countrant being the call of the call of the countrant being the call of the call of the call of the call constants involved. It is believed that the system would transfer satisfactorily to watersheds in other parts of the country with possible alteration of the constants being the only necessary change. (Poertner) W73-06463

FLOOD PROOFING PUBLIC FACILITIES, Cincinnati Engineering Div., Ohio. B. H. Kock.

Paper delivered at American Public Works Association Institute for Municipal Engineering Annual Meeting, Minneapolis, Minnesota, September 25, 1972. 8

Descriptors: *Flood protection, *Flood control, *Floodproofing, *Ohio River, Annual flood, Land use, Flood frequency, Flood plain regulation, Ohio, Dikes, Drainage systems, Floodgates, Danns, Protection, Ohio.

Identifiers: *Cincinnati (Ohio).

Six basic requirements for planning and design of flood protection measures are: (1) determination of maximum flood levels and frequencies and a flood-frequency record for frequencies down to two-year intervals, (2) a determination of substrata soil types, (3) adequate floodgates in the flood protection perimeter, (4) provisions for pumping internal and surface water and liquid wastes from a central sump or collecting reservoir, (5) provision for dewatering if the flood protection deaign is for less than a maximum flood, and the flood protection facility is overtopped, and (6) sealing of conduit penetrations in the flood perimeter protection facility. These criteria were

applied in the Cincianati area. Case examples are given of floodproofing of structures, one of which is The Riverfront Stadium built almost at the water line of the Ohio River. An initial plan would have put the playfield at the elevation of the maximum flood stage of the Ohio River, but in an attempt to achieve greater economy and a better functioning system the field was built at ground level. Hydrologically, this represents the 60 foot, 4-year return frequency river flood stage. Protection for a 74.5 foot, 100-year return frequency stage was provided by means of a perimeter flood wall and an extensive underground seepage control system. A dewatering system consists of 16 pressure relief wells with submersible pumps, collector ring and discharge pumps. (Poertner)

AN ANALYSIS OF PITTSBURGH STORM INLET CAPACITIES AND SPACING REQUIRE-

MENTS, Pittsburgh Urban Redevelopment Authority, Pa. For primary bibliographic entry see Field 08A. W73-06473

REGIONAL FLAN FOR SEWERA DRAINAGE, AND WATER SUPPLY. Clinton Bogert Associates, For Lee, N.J. For primary bibliographic entry see Field 05D. W73-06496 SEWERAGE.

4B. Groundwater Management

HYDROGEN SULPHIDE REMOVAL FROM

WELL WATER, Ohio State Univ., Columbus. For primary bibliographic entry see Field 05F. W73-05901

CHLORINATING FARM AND HOME WATER

SUPPLIES, Ohio State Univ., Columbus. For primary bibliographic entry see Field 05F. W73-05902

IRON REMOVAL FROM WELL WATER. Ohio State Univ., Columbus. For primary bibliographic entry see Field 05F. W73-05903

THE ROLE OF GROUND WATER IN THE NA-TIONAL WATER SITUATION, Geological Survey, Washington, D.C. C. L. McGuinness.

Water-Supply Paper 1800, 1963. 1121 p, 2 fig, 4 plates, 2495 ref.

Descriptors: Groundwater, "Groundwater availability, Groundwater basins, "Groundwater resources, Surface water availability, Irrigation, United States, Reservoirs, Reservoir evaporation, Runoff, Aquifers, Aquifer management, Aquifer systems, Irrigated land, Industrial water, Water pollution, "Water consumption, Water demand, Water levels, Water level fluctuations, "Water resources development, Physiographic provinces. Identifiers: Regional studies.

Principles of water occurrence and the water situa-tion in the United States are outlined briefly, with emphasis on the occurrence of ground water and the status of development and accompanying problems. Water problems facing the Nation are divided into six categories: supply and demand, distribution, natural water quality, man-made pol-lution, variability, and floods. New or improved techniques that will be tested as methods of in-creasing water supplies include (1) reduction of evaporation and transpiration, (2) improved irriga-tion practices, (3) improved treatment methods,

(4) conversion of saline water, (5) weather modifi-cation, and (6) improved use and control of ground water. (Campbell-NWWA) W73-05904

DELINEATION OF AREAS FOR TERRESTRIAL DISPOSAL OF WASTE WATER, Idaho Bureau of Mines and Geology, Moscow For primary bibliographic entry see Field 05D. W73-05907

BOREHOLE GEOPHYSICAL METHODS FOR ANALYZING SPECIFIC CAPACITY OF MUL-TIAQUIFER WELLS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 08G. W73-05911

CONSTANT-HEAD PUMPING TEST OF A MUL-TIAQUIFER WELL TO DETERMINE CHARAC-TERISTICS OF INDIVIDUAL AQUIFERS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 08B. W73-05912

FLOWING ARTESIAN WELLS IN WASHING-

TON STATE,
Washington State Dept. of Conservation, Olympia. Div. of Water Resource.
D. Molenaer.

D. Molenaar. Water Supply Bulletin No 16, 1961. 115 p, 8 fig, 1 plate, 36 ref.

Descriptors: "Washington, "Artesian wells, Artesian heads, Artesian aquifers, Flow measurement, "Surveys, Irrigation, Basalts, Groundwater, Groundwater resources. Identifiers: "Flowing wells, Shut-in pressure, Volcanic aquifers, Piezometric surface.

canic aquifers, Piezometric surface.

This compilation of data on flowing artesian wells was initiated in order to determine the availability of uncontaminated ground water supplies in the event that local or State-wide power failures preclude the use of water obtainable only by electrically-operated pumping facilities. It is believed that this report will be of assistance to drillers by pointing out those areas where they might anticipate penetration of artesian zones. Through information presented here, the driller can make preparations before drilling to cap the well and to perform any sealing operations which may be necessary to prevent the free flow of water from around the well casing. A tabulation of wells, composed of data from studies conducted by the Division of Water Resources, the U.S. Geological Survey, and drillers' logs is given. In many cases, wells have been altered or plugged and no longer exist, or their flows have either diminished considerably or have ceased entirely over the years. (Smith-NWWA)

THE ACCURACY OF THE SOLUTIONS OF UN-STEADY FLOW TOWARD A WELL, Hydronautics, Inc., Laurel, Md. For primary bibliographic entry see Field 08B. W73-05918

WATER WELL STANDARDS: SAN JOAQUIN COUNTY.
California State Dept. of Water Resources, Sacramento. For primary bibliographic entry see Field 05B. W73-05920

RESEARCH TRENDS IN GROUNDWATER MOVEMENT AND WELL HYDRAULICS, New Mexico Inst. of Mining and Technology Socorro. Dept. of Ground-Water Hydrology. For primary bibliographic entry see Field 08B.

W73-05921

SEA WATER INTRUSION, ARTIFICIAL RECHARGE, AND SURFACE WATER-GROUND WATER RELATIONSHIPS: A GENERAL STATEMENT, New Mexico Inst. of Mining and Technology, Socorro. Dept. of Ground-water Hydrology. C. E. Jacob.

In: Proceedings.

oceedings of the National Symposium on d-Water Hydrology, p 184-187, November

Descriptors: Groundwater, Wells, Water wells, *Research and development, Reservoirs, Reservoir yield, Basins, *Conjunctive use, *Aquifer management, Saline water intrusion. Identifiers: *Groundwater basin management,

The theory of conjunctive use of surface-water and ground water reservoirs is discussed, and constraints under which plaaners, designers, and operators of water supply systems have had to operate are noted. Social and political constraints, such as determination of ownership of water, are emphasized as being as important as geologic conjunctive use. Due to their sluggish nature, much more proficiency and accuracy in predicting and managing trends in ground water reservoirs is needed in order for effective conjunctive use to the come about. Too much time is spent in study and needed in order for effective conjunctive use to come about. Too much time is spent in study and re-description of already studies areas. A new direction towards practical research instead of pure scientific study is emphasized, in order that our ground water resources may soon be developed for the greatest benefit to mankind. (Smith-NWWA) W73-05922

SALT WATER INTRUSION IN COASTAL WELL FIELDS, North Carolina State Univ., Raleigh. For primary bibliographic entry see Field 02L. W73-05923

SEAWATER ENCROACHMENT IN HAWAIIAN SEAWATER ENCROACHMENT IN HAWAIIAN
GHYBEN-HERZBERG SYSTEMS,
Hawaii Univ., Honolulu. Water Resources
Research Center.
For primary bibliographic entry see Field 02L.
W73-05924

GROUNDWATER RECOVERY, Technische Hogeschool, Delft (Netherlands). L. Huisman. Winchester Press, New York, New York, 1972,

Descriptors: Groundwater, "Groundwater availability, Groundwater recharge, "Water wells, Infiltration galleries, Hydrologic cycle, "Aquifer management, Artesian aquifers, Well casings, Well screens, Unsteady flow, Steady flow, Drilling, Rotary drilling, Identifiers: "Radial collector wells, Unconfined aquifers, Well losses, Percussion drilling.

As the problems of providing adequate water supplies to modern socity become increasingly difficult, it is inevitable that greater use will be made of groundwater, as distinct from surface water sources. Methods of groundwater recovery for domestic, municipal, and industrial use are presented, including the basic theoretical concepts of groundwater flow to both infiltration galleries and single wells are described. Additional information on the recovery of groundwater by means of wells includes test pumping analysis, methods of well construction (dug, bored, driven, jetted, drilled), well casing and well screen, well completion and well maintenance, and pumping

equipment for wells. Radial collector wells are discussed. Written mainly for the design engineer, the text concerns itself with actual situations, and answers to problems in terms of real numbers for discharges, depths, spacings, etc., are given. (Smith-NWWA) W73-05933

PERSPECTIVES IN ARTIFICIAL RECHARGE, Louisiana State Univ., Baton Rouge. R. G. Kazmann. In: Proceedings of the National Symposium on Ground-Water Hydrology, p 188-192, November, 1967.

Descriptors: Aquifers, "Artificial recharge, "Impounded waters, Impoundments, Flood control, Hydroelectric power, Irrigation, Groundwater mining, "Groundwater recharge, Groundwater barriers, Saline water intrusion, Silting, Storage capacity, "Reservoir storage.

Identifiers: Energy sources.

With the depletion of the stock of reservoir sites, the potentialities of aquifers as reservoirs to be alternately filled and emptied must be reexamined. For the most part, aquifers have not been considered as reservoirs, but as potential water-mines. However, it is shown that events have caused people to reconsider the role of aquifers. The line of injection wells along the coast near Los Angeles is an example. This line of wells is designed to create a pressure barrier to stop the landward movement of sea water. The significance of this technology goes beyond the containment of salt-water encroachment. The advantages of aquifers over surface water impoundments as reservoirs for cyclic face water impoundments as reservoirs for cyclic Tace water impoundments as reservoirs for cyclic storage of water are: (1) permanence; (2) no loss of storage capacity due to sedimentation; (3) no loss of water due to evaporation; (4) invulnerability to destruction or contamination; and (5) the absence of threat to downstream communities (there is no dam to break and no flood to be feared). (Camp-bell-NWWA) W73-05935

IDENTIFICATION OF PARAMETERS IN FINITE LEAKY AQUIFER SYSTEM, California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 02F.
W73-05959

TRANSIENT FLOW TO FINITE WELL IN UN-CONFINED AQUIFER,
California Univ., Los Angeles. School of Engineering and Applied Science.
R. M. Clever, I. Catton, and R. L. Perrine.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 99, No HY3, Paper
9611, p 485-494, March 1973. 7 fig, 5 ref.

Descriptors: *Unsteady flow, *Groundwater movement, *Water table, *Equations, Water yield, Drawdown, Withdrawal, Numerical analy-sis, Water wells, Mathematical studies.

The problem of nonsteady radial flow toward a finite well in an unconfined aquifer is solved by a form of the Galerkin method. The equations are reduced to a set of coupled nonlinear ordinary differential equations in the time-dependent Galerkin coefficients, with a constraint equation due to the nonlinear well bore boundary condition. These are solved numerically by the Adams method for a range of forcing. An eight term approximation proves sufficient to yield good results for the trial functions used. Where comparison is possible, there is good agreement with other results and other solution methods. Response of the flow system depends strongly on the parameters The problem of nonsteady radial flow toward a system depends strongly on the parameters characterizing the aquifer. Time to maximum drawdown at the well is very sensitive to production rate and well radius. A similarity transformation for this problem, with a singularity at r±0, frequently appears. Retransformation to remove the singularity yields a more thorough understanding of the range of validity of the solution. (Knapp-USGS)
W73-05962

GROUND-WATER OCCURRENCE GROUND-WATER OCCURRENCE IN NORTHERN AND CENTRAL PARTS OF WESTERN COLORADO, Geological Survey, Denver, Colo.
A. J. Boettcher.
Colorado Water Conservation Board Water Resources Circular No 15, 1972. 25 p, 3 fig, 6 colorado

plate, 7 tab, 35 ref.

Descriptors: "Groundwater resources, "Aquifer characteristics, "Water wells, "Water utilization, "Colorado, Hydrogeology, Hydrologic data, "Basic data collections, Water yield, Water quality, Geology, Maps, Thermal springs, Water temperature, Surface waters, Groundwater recharge.

Groundwater resources are described for a 29,000-square-mile area in western Colorado. The area includes all or parts of 15 counties and is drained by the Colorado, Gunnison, White, Yampa, and Green Rivers. Data summaries include the availability of groundwater, extent of current groundwater use, and problems that are associated with managing and using groundwater. Other basic information includes geologic, land use, soils, and land status (ownership) maps. The 35 reports used in the study are shown in the references. Groundwater supplies 18 of the 51 towns in the area. Four towns are supplied by ground and surface water, and 29 use surface water. Abous 28% or 6.9 mgd of the 25 mgd water used by towns in 1970 was from wells and springs, whereas 72% or 18.1 mgd was from streams. Groundwater is well suited for domestic supplies because well systems are cheaper and more sanitary than most small surface-water systems. Despite rather widespread use of groundwater, only 141 of the more than 4,000 water wells are reported to yield more than 100 gpm. (Woodard-USGS)

GROUNDWATERS OF THE HERETAUNGA PLAINS, HAWKE'S BAY.
Ministry of Works, Wellington (New Zealand).
Water and Soil Conservation Div.

New Zealand Ministry of Works Hydrological Research Progress Report No 10, 1972. 11 fig, 6

Descriptors: *Groundwater resources, *Water Descriptors: "Groundwater resources, "Water resources development, "Aquifer characteristics, "Water wells, "Hydrologic data, Water yield, Water quality, Water table, Water level fluctua-tions, Water utilization, Groundwater movement, Water supply, Groundwater recharge, Surface waters, Planning, Water pollution sources, Water Identifiers: *New Zealand, Heretaunga Plains

For domestic, agricultural and industrial purposes a population of about 95,000 draws its water supplies from the groundwaters of the Heretaunga Plains, New Zealand. This concerns the cities of Napier and Hastings, the Borough of Havelock North, and a portion of the Hawke's Bay County. In the dry season, when water usage reaches a maximum, considerable competition for water occurs. During the last 10 years water extracted from the system has increased greatly, and current annual increases in population, industries, and agriculture indicate that the problems of extraction are likely to worsen. Increasing urbanization and industrial development increases both the quantities and the difficulties of water disposal and therefore increases the possibilities of water pollution. A sound understanding of the groundwater

Field 04-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

system is necessary for its sustained wise management for the greatest social and economic benefit. Understanding requires a good knowledge of system boundaries, system inputs, system outputs, and aquifer characteristics. Progress to date is outlined. Much of present knowledge and thinking is still at the hypothetical stage and requires testing. (Woodard-USGS) W73-05974

HYDROLOGIC CONDITIONS DURING 1971 IN DADE COUNTY, FLORIDA, Geological Survey, Tallahasee, Fla. For primary bibliographic entry see Field 02A. W73-05980

GENERALIZED SUBSURFACE GEOLOGY OF THE WATER-BEARING NORTHERN SAN JOAQUIN CALIFORNIA, DEPOSITS. VALLEY. Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 02F. W73-05982

GROUNDWATER REGIME OF WATER-LOGGED LANDS AND ITS REGULATION,

LOGGED LANGE B. S. Maslov.

B. S. Maslov.

Kolos: Moscow. 1970, 232 p, Illus.

Kolos: Moscow. 1970, 232 p, Illus.

Vaculifiers: Amelioration, Books, *Drainage, UISSR, *Waterlogged Identifiers: Amelioration, Book *Groundwater regime, USSR, lands, Water regulation, Bogs.

A hydrologic-ameliorative typification of drained lands, with basic schemes of their water alimenta-tion is presented. The natural groundwater regime tion is presented. The natural groundwater regime on bogs, bogged and waterlogged lands (in the nonchernozem zone), the agriculturally optimal groundwater regimes, changes in the hydrological conditions due to drainage and various complex ameliorations are described. Conditions of formaameliorations are described. Conditions of forma-tion of the groundwater regime of waterlogged lands, the natural and optimal groundwater regimes and their regulation, changes due to the in-fluence of drainage, temperature and water exchange between groundwater and the aeration zone, and methods for studying the groundwater regime are discussed.—Copyright 1972, Biological Abstracts, Inc. W73-05999

METHODS OF DETERMINING AQUIFER STORAGE CAPACITY AND FRESH-SALINE WATER INTERFACES BY GEOELECTRICAL INVESTIGATIONS, Missouri Water Resources Research Center, Rol-

R. K. Frohlich. R. A. Fronnen.
Available from the National Technical Informa-tion Service as PB-216 812, \$3.00 in paper copy, \$0.95 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, December, 1972, 39 p, 13 fig, 2 tab, 13 ref. OWRR A-046-MO (1).

Descriptors: Resistivity, Groundwater, Aquifers, Saline Water, Freshwater interfaces, *Resistivity, Clays, *Missouri, *Conductivity, Wells. Identifiers: Geoelectrics, Glacial stream channels.

Geoelectrical investigations in Grundy County of Geoelectrical investigations in Grundy County of northwestern Missouri where the groundwater resources of the glacial deposits have already been examined through an extensive drilling program by the Missouri Geological Survey and Water Resources, indicate that water-bearing gravel deposits can be distinguished from glacial deposits containing appreciable amounts of clay and limited amounts of water. The Schlumberger method used amounts of water. The Schumberger menod used for the geoelectric depth soundings in the vicinity of the Survey's drillholes demonstrates the ex-ploratory usefulness of the method in that it can partly replace the more expensive procedure of drilling. The method also provides improved interpretation between drillholes. Results of the investigation show that, in the area, clay has a resistivity below 20 megohms, that the fresh water-bearing gravel at the bottom of the buried glacial stream channels has a resistivity of 40 to 50 megohms, and that the near surface glacial gravel deposits have a resistivity above 100 megohms. Interpretation of the depth soundings and the conductivity of water obtained from a local well interpretation to the depth soundings and the conductivity of water obtained from a local well interpretation to make the saline water of the saline plies that its water is drawn from the saline water of the bedrock. A recommendation is made for the quality of improvement of this particular well. W73-06033

THE DETECTION AND MAPPING OF SUBTER-RANEAN WATER BEARING CHANNEL, Missouri Water Resources Research Center, Rol-

la.
R. D. Rechtien, and L. W.Gardner.
Available from the National Technical Information Service as PB-216 813, \$3.00 in paper copy,
\$0.95 in microfiche. Missouri Water Resources
Research Center, Columbia, Completion Report,
December, 1972. 15 p, 4 fig, 15 ref. OWRR A-051-

Descriptors: *Seismic studies, *Resource, Vibrations, Underground streams.

Results are presented of an experiment designed to determine the vibrational characteristics of sub-terranean voids. The objective was to evaluate the resonance phenomenon, as reported by early investigation, as an appropriate mechanism for the development of a cavity detection and delineation tool. The results, while not entirely establishing the existence of resonance per se, establishes a diagnostic reverberant seismic event that shows much promise as a detection mechanism. The use of three-component seismometers, and particle trajectory analysis, restores practicality to the reflection method.
W73-06034

BIOLOGICALLY MEDIATED CHEMICAL CHANGES IN THE FILTRATION OF AERATED GROUND WATERS, Illinois Univ., Urbana. For primary bibliographic entry see Field 05F. W73-06060

MICROBIOLOGICAL QUALITY OF SUBSUR-FACE DRAINAGE WATER FROM IRRIGATED AGRICULTURAL LAND, Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center. For primary bibliographic entry see Field 05B.

GROUND-WATER RESOURCES OF MERCER

GROUND-WATER RESOURCES OF MERCER AND OLIVER COUNTIES, NORTH DAKOTA, Geological Survey, Bismarck, N. Dak. M. G. Croft. North Dakota Geological Survey Bulletin 56, Part III, and North Dakota Water Commission County Ground Water Studies 15, Part III, 1973. 81 p. 37 fig, 2 plate, 3 tab, 38 ref.

Descriptors: "Groundwater resources, "Aquifer characteristics, "Hydrogeology, "Water wells, "North Dakota, Hydrologic data, Basic data collections, Water yield, Water utilization, Water quality, Transmissivity, Storage coefficient, Groundwater recharge, Hydrographs, Water level Identifiers: *Mercer and Oliver Counties (N Dak).

In Mercer and Oliver Counties, North Dakota, ar-In Marcer and Order Counters, North Jaxon, ar-tesian aquifers consisting of fine- to medium-grained sandstone occur in the Fox Hills and Hell Creek Formations of Late Cretaceous age and the Tongue River Formation of Tertiary age. The water is suitable for livestock, domestic, and some

industrial uses. The total withdrawal from the artesian aquifers is about 1 million gallons per day. Glacial and alluvial deposits of sand and gravel form potentially productive aquifers beneath the valleys of Goodman, Antelope, Square Butte, and valleys of Goodman, Antelope, Square Butte, and Elm Creeks and the Knife and Missouri Rivers. The aquifers, which are relatively undeveloped, are 1 to 5 miles in width, have a manufacture of the control of the contro are 1 to 5 miles in width, have a maximum thickness of about 250 feet, and contain about 2,640,000 acre-feet of groundwater. The Knife River aquifer near Stanton has a transmissivity of 176,000 gpd per foot and a storage coefficient of 0.0003. The Missouri River aquifer near Heasler has a transmissivity of 107,000 to 121,000 gpd per has a transmissivity of 107,000 to 121,000 gpd per foot and a storage coefficient of 0.02. Approxi-mately 137,000 acre-feet of water was used in Mercer and Oliver Counties in 1968. Most of this water was taken from the Missouri River for cool-ing purposes in electric-generating plants and for irrigation. About 2,270 acre-feet was obtained from groundwater sources for industrial, livestock, and domestic use. (Woodard-USGS) W73-06182

WATER WELL CONSTRUCTION TECHNOLO-GY, PART 1 - AN INTRODUCTION, National Water Well Association, Columbus, For primary bibliographic entry see Field 08A. W73-06192

EXPLORATION FOR HIDDEN WATER,' BY MOHAMMAD KARAJI - THE OLDEST TEXT-BOOK ON HYDROLOGY. Pahlavi Univ., Shiraz (Iran). Dept. of Geology. For primary bibliographic entry see Field 02F. W73-06205

NITROGEN CONTENT OF GROUND WATER IN KINGS COUNTY, LONG ISLAND, NEW YORK, Geological Survey, Mineola, N.Y. For primary bibliographic entry see Field 05B. W73-06219

HYDRAULIC SAND-MODEL STUDIES OF MIS-CIBLE-FLUID FLOW, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 02L. W73-06226

DISCRETE TIME STEPS IN DIGITAL COM-PUTER ANALYSIS OF AQUIFERS CONTAIN-ING PUMPED WELLS, Birmingham Univ. (England). Dept. of Civil En-gineering. K. R. Rushton.

Journal of Hydrology, Vol 18, No 1, p 1-19, January 1973. 7 fig, 1 tab, 10 ref.

Descriptors: *Numerical analysis, *Groundwater movement, Water yield, Aquifers, Computer models, Mathematical models, Finite element analysis, Drawdown, Digital computers, Analyti-

When digital computers are used in the analysis of time variant groundwater flow in an aquifer, the time is divided into discrete intervals. These distime is divided into discrete intervals. These discrete time steps can cause oscillations or other errors in the solutions particularly when wells start and stop pumping. A large number of solutions were obtained with a wide range of time steps using three implicit methods, the Crank-Nicholson method, the alternating direction implicity method, and the backward difference method. By comparing the results with theoretical values, recommendations are made to aid the choice of the optimum time interval. (Knapp-USGS)

WATER QUANTITY MANAGEMENT AND CONTROL-Field 04

Effects on Water of Man's Non-Water Activities-Group 4C

THERMAL AND MINERAL WATERS OF NON-METEORIC ORIGIN, CALIFORNIA COAST RANGES, Geological Survey, Mealo Park, Calif. For primary bibliographic entry see Field 02K. W73-06252

THE EFFECT OF TEMPERATURE ON WAVE VELOCITIES IN POROUS ROCKS, California Univ., Berkeley. Coll. of Engineering. For primary bibliographic entry see Field 08E. W73-06257

PRELIMINARY REPORT ON LAND-SURFACE PRELIMINARY REPORT ON LAND-SURFACE
SUBSIDENCE IN THE AREA OF BURNETT,
SCOTT, AND CRYSTAL BAYS NEAR
BAYTOWN, TEXAS,
Geological Survey, Houston, Tex.
R. K. Gabrysch.
Geological Survey open-file report, February
1973. 25 p, 6 fig, 12 ref.

Descriptors: *Land subsidence, *Groundwater, *Withdrawal, Water wells, *Texas, Mining, Oil wells, Data collections, Pumping, Water levels, Aquifer characteristics, Industrial water, Water utilization.

Identifiers: *Harris County (Tex.).

Removal of water, oil, and gas from the subsurface in Harris County, Texas, has caused declines in fluid pressures which have resulted in subsidence of the land surface. One critical area of nce is in the area of Burnett, Scott, and Crystal Bays near Baytown. Much of this area is now subject to inundation by high tides. Production of oil and gas from the Goose Creek Field at the southern edge of Baytown had caused as much as 3.25 feet of subsidence by 1925. The subsidence bowl is restricted to the area of production and has not extended to the area of Burnett, Scott, and Crystal Bays. Withdrawals of water from large-capacity industrial wells, which resulted in declines in artesian pressure, began about 1918; as much as 250 feet of water-pressure decline has occurred in the Evangeline aquifer. Significant subsidence of the land surface began about 1920. Possibly as much as 7.5 feet of subsidence had occurred in the area by 1971. (Woodard-USGS) W73-05385 Crystal Bays near Baytown. Much of this area is

WATER-RESOURCES INVENTORY, SPRING 1966 TO SPRING 1971, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA, Geological Surgery Monto Barb. Co. 17 Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 07C. For primar W73-06390

THE ACTIVE LENGTH OF WELL SCREENS (KUTSZUROK AKTIV HOSSZANAK VIZ-SGALATA), For primary bibliographic entry see Field 08B. W73-06399

REPORT ON GROUNDWATER, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F.

DECISION RULES IN CHANCE-CONSTRAINED PROGRAMMING: SOME EXPERIMENTAL COMPARISONS,

Norwegian Inst. of Urban and Regional Research.

Oslo.
D. V. Smith.
Management Science, Vol 19, No 6, p 688-702,
February, 1973. 5 fig, 1 tab, 9 ref.

Descriptors: *Stochastic processes, Water delivery, *Irrigation, *Planning, Crops, Water

requirements, Constraints, Water demand, Humid areas, Water balance, Evaluation, Hydrologic aspects, Economics, Groundwater, Surface water, Drainage, Rice, Rainfall, Evapotarnspiration, Water quantity, Water supply, "Conjunctive use. Identifiers: "Chance-constrained programming, "Investment decisions, Decision rules, Bangladesh.

A stochastic programming model for the evalua-tion of investment in irrigation is presented. The model reflects the complex hydrologic and economic interactions that arise from considera-tion of the conjunctive use of ground and surface water, the need for provision of drainage to irrigated lands, and the use of some lands for rice cultivation. The implications of stochastic cultivation. The implications of stochastic precipitation are discussed. Several decision rules for system operation are presented and discussed in terms of computation requirements and the possibility of field implementation. Deterministic equivalents to the probabilistic water requirement constraints are derived for zero-order, linear, and two-piece decison rules to be used. An irrigation project proposed for Bangladeah is used to illustrate some passible consequences for investment trate some possible consequences for investment planning of the choice of decision rules. Decision planning of the choice of decision rules. Decision rules in chance-constrained programming are seen as tools for effecting good approximate solutions to stochastic programming problems when used with knowledge of the technical aspects of the in-vestment decisions to be analyzed. (Bell-Cornell) W73-06438

GROUND WATER GEOLOGY, Pennsylvania Dept. of Health, Harrisburg. Div. of Sanitary Engineering. G. H. Emrich. Publication No 11, March 1966. 27 p, 10 fig, 7 ref.

Descriptors: *Groundwater, *Water supply, *Mu-Descriptors: "Groundwater, "Water supply, "Mu-nicipal water, "Pennsylvania, "Groundwater management (Applied), "Groundwater mining, "Wells, Well yield, Groundwater potential, Hydrologic cycle, Hydrology, Groundwater potential, Water supply development, Water table aquifers, Geology, Geologic investigations. Identifiers: *Emergency water.

In 1963, 39 towns in Pennsylvania with public water supplies made requests for the use of emer-gency water. Local deficiencies in water supply gency water. Local deficiencies in water supply exist in Pennsylvania and the development of groundwater sources, which is inevitable, must be preceded by a knowledge of groundwater geology. In the year 1960, he use of groundwater in Pennsylvania was of major importance. Approximately, 520 mgd of groundwater was consumed out of a total consumption of 13 bgd. Because groundwater is preferable to surface water for several reasons (constant year-round temperature, constant supply, and constant quality), developconstant suppty, and constant quanty), develop-ment of groundwater resources can be expected to grow rapidly in the future. The basic hydrologic cycle is described in this publication. Groundwater is defined as the difference between precipitation, runoff and evaporation. It is contained in all rock strata in Pennsylvania. High mineral concentration in ground water are found in limestone and low mineral concentrations are found in sandstone. Vields of wells are variable even in similar soil Miletal Colliculations are touted in similar soil types. Shale has very poor yield characteristics, while sandstone and gravels, associated with glacial deposits, are locally important groundwater sources. (Poertner)

W73-06457

POTENTIAL BENEFITS OF WATER MANAGE-MENT IN THE GRAND PRAIRIE OF ARKAN-

SAS, Arkansas Univ., Payetteville. Dept. of Agricul-tural Engineering. C.L. Griffis.

C. L. Griffis.

Paper presented at 1972 Annual Meeting of the
American Society of Agricultural Engineers, June

27-30, 1972, Hot Springs, Arkansas. 9 p, 6 fig, 3 ref. OWRR A-010-ARK (2).

Descriptors: "Aquifers, "Groundwater, "Arkan-sas, Groundwater availability, Groundwater recharge, Mathematical models, Water demand, Water supply.
Identifiers: *Grand Prairie. Ark.

The Quaternary aquifer in the Grand Prairie of Arkansas is an important groundwater reservoir to the agricultural potential of the state. However, water withdrawal from the aquifer has for many years exceeded the natural recharge rate. Consequently, the water table has steadily declined, creating a water shortage in those areas farthest from the sources of recharge. In order to evaluate alternative methods of solving the groundwater shortage problem, a mathematical model was developed for the aquifer. The model's reliability was verified by having it predict 1959 water levels from 1939 water table elevations. A comparison with actual 1959 water level measurement isfrom 1939 water table elevations. A comparison with actual 1959 water level measurement incited substantial agreement between the actual and predicted values. To evaluate the possible effects on the aquifer if the water depletion problems remain unsolved, 1959 water table elevations were used as a basis for projecting elevations for 1979. The model was also employed to determine the level of water management that would be required to achieve a stable water table. The 1959 water table was arbitrarily chosen as the desired condition. The model's results are presented in several contour maps. (Settle-Wisconsin) W73-06482

WATER RESOURCES IN THE TAMPA BAY RE-WALER RESOURCE
GION.
Briley, Wild and Associates, Daytona Beach, Fla.
For primary bibliographic entry see Field 03D.
W73-06499

4C. Effects on Water of Man's Non-Water Activities

DESIGN CRITERIA FOR SUBMARINE PIPELINE CROSSINGS. Ottawa Univ. (Ontario). For primary bibliographic entry see Field 08A. W73-05940

THE GREAT SALT CONTROVERSY, For primary bibliographic entry see Field 05B. W73-05970

APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO AN URBANIZING WATERSHED, Clemson Univ., S.C. Water Resources Research

Jast.
J. R. Hendricks, Jr., and J. T. Ligon.
Available from National Technical Information
Service as PB-216 808; \$3.00 in paper copy, \$0.95
in microfiche. South Carolina Water Resources
Research Institute, Clemson, Report No. A35,
1973. 80 p, 15 fig, 14 tab, 33 ref. OWRR A-024-SC

Descriptors: *Model studies, Runoff, *Urbaniza-tion, Land use, *Watersheds (Basins), *South Carolina, *Simulation analysis. Identifiers: *Stanford watershed model (OPSET), edmont, Reedy River basin, *Greenville (So.

This study examined an urbanizing watershed, the Reedy River basin near Greenville, South Carolina. The objective was to determine certain hydrologic characteristics of the basin using available data and to investigate changes brought

SIGH OA-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C—Effects on Water of Man's Non-Water Activities

about in these characteristics by the process of urbanization. A self-calibrating version of the Stanford Watershed Model named OPSET was applied to the Reedy River data. To investigate changes in the hydrologic characteristics, parameters were estimated for a rural watershed comparable to the Reedy River basin in size and configuration. Also, parameters were estimated for the Reedy River basin without subtracting the estimated diversions from the recorded flows. These two applications were used to investigate the effects of precipitation and diversions on the OPSET-estimated parameters, after which changes in the hydrologic characteristics brought about by urbanization were studied. Average hydrologic characteristics of the Reedy River basin were obtained as a result of the study. These valves can be used in the 1970 Kentucky version of the Stanford Watershed Model to simulate flows. However, the study interest stage of development to detect significant changes brought about by urbanization of the basin. basin. W73-06028

EFFECT OF FORESTS IN THE SAKHALIN RIVER BASIN ON THE NATURAL REPRODUC-TION OF SALMON (IN RUSSIAN), A. N. Kanid'ev, S. A. Salman, and A. E.

Izv Sakhalin Otd Geogr O-Va SSSR. 1. p 160-172.

1970.
Identifiers: *Forests, Reproduction, Sakhalin River basin, *Salmon, USSR.

River basin, "Salmon, USSR.

The reproduction of pink salmon was studied in the Firsovka and Lozovaya Rivers on the eastern ahore of Sakhalin, which differ sharply as to the amount of forest preserved in their basins. In the former the forest is equal to 85.09%, in the latter 24.3%. Additional physicogeographical factors which affect pink salmon reproduction are about the same. In the Firsovka River, reproduction is about 14-30% more effective than in the Lozovaya River. The decreased effectiveness in the latter is due to changes in a series of abiotic conditions which are related to the degree of forestation. The rivers differ as to the monthly distribution of drainage, temperature regime and content of O2, CO2 and sediments in the water. In order to preserve the optimal hydrological conditions for the reproduction of salmon, the forest should not be decreased below 40-50%.—Copyright 1972, Biological Abstracts, Inc.

LAND-USE EFFECT ON THE WATER REGIMEN OF THE U.S. VIRGIN ISLANDS, Geological Survey of Puerto Rico, San Juan. D. G. Jordan. In: Geological Survey Research 1972, Chapter D; U.S. Geological Survey Professional Paper 800-D, p D211-D216, 1972. 8 fig, 4 ref.

Descriptors: *Land use, *Water balance, *Virgin Isalnds, *Reforestation, Evapotranspiration, In-terception, Vegetation establishment, Climates, Rainfall, Water yield, Recharge.

Base flow of mountain streams on the three main islands of the U.S. Virgin Islands is diminishing because of changes in land use, particularly reversion of land from agriculture to dense brush and forest. Rainfall that once infiltrated below the shallow root zone of crops increasingly has been intercepted and transpired by deep-rooted wild growth. Recharge to the bedrock aquifer and consequent has flow thus have been reduced. Longuezet has flow thus have been reduced. Longuezet has flow thus have been reduced. Longuezet has flow thus have been reduced. sequent base flow thus have been reduced. Long-term decline in rainfall since the early 1900's is a contributing factor. (Knapp-USGS) W73-06221

THE QUALITATIVE AND QUANTITATIVE ANALYSIS OF URBAN RUNOFF FOR THE

AREA OF THE MEMORIAL SCHOOL RED MAPLE SWAMP IN SPRINGFIELD, MAS-SACHUSETTS, Massachusetts Univ., Amberst. Graduate

Massachusetts Univ., Amherst. Graduate Research Center. C. Brigham. Massachusetts Water Resources Research Center Research Report, June 1972. 92 p, 13 ref, 4 ap-pend. OWRR A-027-MASS (1).

Descriptors: "Urban hydrology, "Storm water, "Urban runoff, "Water pollution sources, "Water quality, Chemical analysis, Storm drains, Inor-ganic compounds, Biological properties, Coliforms, Nitrates, Phosphates, Data collections, *Massachusetts. Identifiers: *Springfield (Mass).

Identifiers: *Springfield (Mass).

A qualitative analysis of storm water for a thickly populated residential area within Springfield, Massachusetts is presented, along with other related data. After determining all the storm drains entering into the Red Maple Swamp a series of chemical, biological, and physical tests were performed on the incoming storm sewer flow. The chemical and physical tests performed were for temperature, pH, dissolved oxygen, carbon dioxide, specific conductance, turbdity, color, copper, silica, tannin and lignin, iron, ammonia nitrogen, nitrite nitrogen, nitrate nitrogen, orthophosphate, total hardness, chloride, sulfate, and discharge. The biological tests performed were the standard plate count and the coliform test. Chloride in storm water is mainly derived from the salting of roads. Chloride concentrations well after salting were recorded as high as 1500 ppm. Approximately 30,072 pounds per year of chloride are supplied to the Red Maple Swamp by its drainage basin. The total inorganic nitrogen content of the Red Maple Swamp influent was 3.64 ppm. Water with the concentration of phosphorus characteristic of that entering the Red Maple Swamp (1.02 ppm) is capable of initiating eutrophication. (Woodard-USGS)

4D. Watershed Protection

STUDIES ON SOIL EROSION CONTROL: III. THE EFFECT ON GREEN BELTS ON SOIL EROSION (IN JAPANESE), Obhihro Zootechnical Univ. (Japan). Lab. of Agricultural and Civil Engineering. Y. Matsuda, Y. Kishi, and S. Furuya. Res Bull Obhihro Zootech Univ Ser I. Vol 6, No 4, p 694-705. 1971. Illus. English summary. Identifiers: "Erosion control, Grass-M, Greenbelts, *Soil erosion.

In the presence of much precipitation (more than 10 mm/10 min), when the grass grew thick, only a small amount of runoff and erosion occurred and when the grass was cut to about 2 cm the runoff coefficient increased to 21-28%, but the increase in the amount of erosion was small. When a bare area was introduced into the plot, the smaller the ratio of width of the green belt to the bare area, the larger the amount of runoff and erosion. The increase of runoff coefficient was not affected by the change in the gradient of the slope, but the amount of erosion increased proportionately with the increase in gradient of the slope. Copyright 1972, Biological Abstracts, Inc.

PUBLIC WORKS AUTHORIZATIONS—C-ONFERENCE REPORT ON S.4018. For primary bibliographic entry see Field 06E. W73-06103

CONSTANT-HEAD FLOATING-SIPHON STAGE-RECORDING SYSTEM, filinois Univ., Urbana. For primary bibliographic entry see Field 02A.

W73-06189

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

MERCURY IN BRYOPHYTES (MOSS), JBF Scientific Corp., Burlington, Mass. For primary bibliographic entry see Field 05B. W73-03851

MERCURY IN MARINE ORGANISMS OF THE TAY REGION,
Dundee Univ. (Scotland). Dept. of Biological
Sciences. nary bibliographic entry see Field 05B.

TRACE ELEMENTS IN HUMAN HAIR, Zambia Univ., Lusaka. Dept. of Biochemistry. M. H. Briggs, M. Briggs, and A. Wakatama. Experientia, Vol 28, No 4, p 406-407, April 15, 1972. 1 tab, 4 ref.

Descriptors: "Trace elements, "Human popula-tion, "Zinc, "Copper, "Iron, Heavy metals, Statistics, Surveys, Pollutant identification. Identifiers: "Human hair, Atomic absorption spec-

Human hair samples were washed, dried, ashed and dissolved in HC1 and the concentrations of copper, iron, and zinc were measured by atomic absorption spectrometry. Means and standard deviations of groups divided by age, sex, ethnic origins, health status etc. were tabulated. Considering the results on all there elements, it is apparent that a large number of factors influence the hair concentration of trace elements, though each element is affected by different factors. Copper is influenced by sex, ethnic origins, health, malnutrition, or the taking of oral contraceptives. Iron is significantly changed only by the taking of antimalarials (usually pyrimethamine), while zinc is influenced by ethnic origin, malnutrition, or pregnancy. Individual variations within a group are large for all three elements and its doubtful if measurements of trace elements in hair could be of any value as a diagnostic aid, though they could provide information in surveys of large groups. (Eagle-Vanderbilt)

IDENTIFICATION AND DETERMINATION OF ORGANOMERCURIAL FUNGICIDE RESIDUES BY THIN-LAYER AND GAS CHROMATOG-

RAPHY, Laboratory of the Government Chemist, London (England). J. O'G, Tatton, and P. J. Wagstaffe. Journal of Chromatography, Vol 44, p 284-289, 1969. 2 tab, 8 ref.

Descriptors: *Mercury, *Gas chromatography, *Chemical analysis, *Fungicides, Analytical techniques, Chromatography, Foods, Laboratory equipment, Sampling, Separation techniques, Pesticide residues, Pollutant identification. Identifiers: *Thin-layer chromatography, *Organomercurials, Fruits.

A study has been made of the thin-layer and gas-liquid chromatographic characteristics of the dithizonates of a number of organomercurial fun-gicides in common use. A method is given for the extraction of these fungicides from apples, potatoes and tomatoes and their identification and determination, as their dithizonates, by thin-layer and gas chromatography. The method that has been found efficient in extraction and clean-up of

all the organomercurials is based on the use of a slightly alkaline solution of cysteine hydrochloride in propan-2-ol. The extract is then washed with diethyl ether or toluene and the organomercurials are extracted with a diethyl ether solution of dithizone. In thin-layer chromatography, the organomercurials in their dithizonate form are separated with a variety of acetone and hexane or light petroleum solvent systems. For gas chromatography the extract is injected onto a 1.5 m column. If arylmercury compounds are present, a aborter column is recommended which gives shorter retention times and narrower peaks. (Obeszkiewicz-Vanderbilt)

FIELD METHODS FOR DETERMINING CER-TAIN ORGANOMERCURIAL VAPOURS IN AIR, Laboratory of the Government Chemist, London

(England). A. A. Christie, A. J. Dunsdon, and B. S. Marshall. Analyst, Vol 92, p 185-191, March 1967, 3 fig, 2 tab. 10 ref.

Descriptors: "On-site tests, "Mercury, "Air, "Analytical techniques, Metals, Colorimetry, Trace elements, Air pollution, Pollutant identifica-tion, Laboratory tests, Laboratory equipment, Sampling, Testing. Identifiers: "Organomercurials, Fluidized bed car-

bon.

Two methods are proposed for determining the vapours of certain organomercury compounds in air, at concentrations in the region of 10 micrograms of mercury per cu.m. The mercurial vapours are collected either on a glass-fibre pad treated with cadmium sulphide, or on a fluidised bed of active carbon. Mercury vapour is released by heating, and is determined by comparing the colour produced on selenium sulphide test-papers with a range of standard colours. The cadmium sulphide method is applicable to the determination of ethylmercury chloride, ethylmercury phosphate, dipheaylmercury and methylmercury dicyandiamide; the fluidised-bed method is also applicable to this range of compounds and, in addition, to diethyl mercury. Mercurial dusts can be determined by the cadmium sulphide method, and mercury vapour by a slight modification of the fluidised-bed technique. In both methods the apparatus used is simple to manipulate and the time needed for a complete determination is less than 30 minutes. (Oleszkiewicz-Vanderbilt)

MICRODETERMINATION OF ORGANIC MER-CURIALS BY THIN-LAYER CHROMATOG-

RAPHY, Kurume Univ. (Japan). School of Medicine. S. Yamaguchi, H. Matsumoto, M. Hoshide, and K.

Akitake. Kurume Medical Journal, Vol 16, No 2, p 35-36, 1969. 4 fig. 1 tab. 5 ref.

Descriptors: "Mercury, "Analytical techniques, "Chromatography, Metals, Ultraviolet radiation, Spectrophotometry, Laboratory tests, Laboratory

Spectrophotometry, Laboratory teass, Laboratory equipment, Testing, Sampling, Separation techniques, Chemical analysis.

Thin layer chromatography, *Organomercurials, UV absorption, Atomic absorpanomercurials, UV absorption, Atomic absorp-

By the newly developed thin layer chromatography, an amount of mercury compound which is too small to be measured so far by the dithizone coloring method has been detected within an approachable range with a reliable accuracy. The separation of inorganic and organic mercurish by this method is fairly acceptable down to about 0.01 micrograms. A clear separation between phenylmercury accetate and methylmercury chloride is sometimes not available by the dithizone coloring

method. Therefore the final recognition of the presence of methyl mercury compound is recommended to be done with careful procedures described in this report or should be evaluated with an additional use of gas chromatography equipped with an electron capture detector. The procedure recommended includes separation of procedure recommended includes separation of the compounds with development of the spotted samples with benzene-benzine solution, removing the silicagel layer at the place of the proper Rf values and measurement of total mercury in the spot by atomic absorption photomery. (Olesz-kiewicz-Vanderbilt) kiewicz-Va W73-05863

DETERMINATION OF METHYLMERCURY COMPOUNDS IN FOODSTUFFS, L. METHYLMERCURY COMPOUNDS IN FISH, IDENTIFICATION, National Institute of Public Health, Stockholm (Sweden). Dept. of Food Hygiene.

G. Westoo.
Acta Chemica Scandinavica, Vol 20, No 8, p 2131-2137, 1966. 6 fig, 1 tab, 8 ref.

Descriptors: "Mercury, "Fish, "Gas chromatography, "Analytical techniques, Chemical analysis, Heavy metals, Pollutani identification, Food chain, Freshwater fish, Water pollution, Fish toxins, Separation techniques, Chromatography. Identifiers: "Thin layer chromatography," Organomercurials, Baltic Sea, Sweden, Methylmer-

A combined gas chromatographic and thin-layer chromatographic method for the identification and determination of methylmercury compounds in fish is presented. For the identification five derivatives of the supposed methylmercury compound from three samples of fish were studied. In thirty samples of fish from the Baltic, Swedish lakes and amples of fish from the Baltic, Swedish lakes and rivers two or three derivatives were analyzed using both chromatographic methods. The samples contained 0.07 - 4.45 mg Hg/kg as methylmercury compounds. Methylmercury compounds were found also in marine fish, but only in small amounts. Any methylmercury attached to a sulphur atom of a nonvolatile compound will not be determined with this method. (Oleszkiewicz-Vanderbilt) W73-05864

ULTRA-MICRO DETERMINATION OF ALKYL-MERCURY COMPOUNDS BY GASCHRO-MATOGRAPHY, Kurume Univ. (Japan). School of Medicine. S. Yamaguchi, and H. Matsumoto. Kurume Medical Journal, Vol 16, No 1, p 33-42, 1969. 8 fig, 3 tab, 2 ref.

Descriptors: "Mercury, "Gas chromatography, "Chromatography, "Chemical analysis, Analytical techniques, Sampling, Separation techniques, Laboratory equipment, Pollutant identification. Identifiers: "Organomercurials, "Alkylmercury.

A modification of Kitamura's method for determination of alkylmercury compounds using an electron capture detector is described. The stationary liquid phase was replaced to 1.4 - butanediol succinate with glass tubing. In addition to the electron capture detector, a puls generator was additionally equipped. Clear separation of alkylmercury compounds in the sample was obtained with high sensitivity. The sample was obtained with high sensitivity. The sample was injected on-column and 0.8 ng of MMC presented a peak at the expected IR with a height of 19.15 cm. An effective method of concentration by accelerated evaporation was developed and employed. The recovery rate was 90%. (Oleszkiewicz-Vanderbilt) W73-05865 A modification of Kitamura's method for deter-

USE OF ANION EXCHANGE RESIN-LOADED PAPER IN THE DETERMINATION OF TRACE

MERCURY IN WATER BY NEUTRON ACTIVA-TION ANALYSIS, Ford Motor Co., Dearborn, Mich. Scientific Research Staff. D. E. Becknell, R. H. Marsh, and W. Allie, Jr. Analytical Chemistry, Vol 43, No 10, p 1230-1233, August 1971. 2 fig, 2 ub, 7 ref.

Descriptors: "Mercury, "Water analysis, "Analyti-cal techniques, "Neutron activation analysis, Iradiation, Anion exchange, Ion exchange, Resins, Organic matter, Chlorine, Chemical degradation, Water pollution, (Jentifiers: "Organic mercury.

A neutron activation analysis method has been developed for the determination of mercury in water at levels of 0.05 to 250 micrograms. A preirradiation concentration of Hg is accomplished through the use of anion exchange resin-loaded filter disks. Hydrochloric acid is added to the water sample and mercury, as HgCl4 (2-), is removed from the solution by an exchange technique. Following the concentration of Hg in the resin the samples are irradiated and the Hg content is determined using a standard comparison technique on the 77-Kev gamma ray from the decay of Hg 197. In solutions containing up to 250 micrograms of Hg, 100% of the Hg is removed by micrograms of Hg, 100% of the Hg is removed by the anion exchange technique. A chlorine treatment is used to degrade organomercury compounds. The method has been applied to a variety of natural water samples, the compositions of which have varied from 0.03 to 6.6 ppb of mercury. (Oleszkiewicz-Vanderbilt)

AMPEROMETRIC DETERMINATION OF MERCURY IN ORGANOMERCURIALS AND PROTEINS, Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Biophysics.
S. Ehrlich-Rogozinsky, and R. Sperling. Analytical Chemistry, Vol 42, No 9, p 1089-1091, August 1970. 2 fig, 3 tab, 12 ref.

Descriptors: *Mercury, *Analytical techniques, *Laboratory equipment, Proteins, Metals, Separation techniques, Electrodes, Electrochemistry, Sampling, Testing, Pollutant identification.

Identifiers: *Amperometry, *Organomercurials.

With the aim of extending the amperometric method for determination of mercury (II) to the submicro scale, a suitable reagent was sought for titrating the mercury. Bis (2-hydroxyethyl) dithiocarbamate for the amperometric titration of trace amounts of mercury (II) at the rotating platinum electrode was finally chosen. Using this system, it was possible to determine rapidly 5-150 micrograms of mercury (II), in a 0.05M borax, 0.1M potassium chloride solution. This method was applied also for the determination of 10-150 micrograms of mercury in organic mercurials and was applied also for the determination of 10-130 micrograms of mercury in organic mercurials and proteins, after wet combustion with perchloric and nitric acid. Samples containing 10-150 micrograms of mercury could be titrated satisfactorily. The accuracy of mercury determination was better than 10%. (Oleazkiewicz-Vanderbilt) W73-03868

VAPOR PHASE SEPARATION OF METHYL-OR ETHYLMERCURY COMPOUNDS AND OR ETHYLMERCURY,
METALLIC MERCURY,
Western Washington Research and Extension
Contex Pavallap.

Western Washington Research and Extension Center, Puyallup. Y. Kimura, and V. L. Miller. Analytical Chemistry, Vol 32, No 3, p 420-424, March 1960.3 fig., 7 tab, 12 ref.

Descriptors: "Mercury, "Air, "Chemical analysis, Chromatography, Heavy metals, Air pollution, Pollutant identification, Analytical techniques, Sampling. Identifiers: *Organomercurials, *Air Sampling,

Group 5A-Identification of Pollutants

A method for the capture of ethylmercury and methylmercury compounds in the presence of mercury vapor was needed in a study of organic mercurial fungicide decomposition in soil. The method developed can be used to trap 10 gamma or more of the alkyl mercury compound in a cubic meter of air. Where the organic and metallic mercury vapors occur together, this method offers means of quantitative separation. Vapors from the sample are pumped through traps of sodium carbonate and disodium phosphate solution to trap the methyl- and ethylmercury, and of potassium permanganate to trap the metallic mercury vapor. The traps are then extracted with chloroform and the decrease in the concentration of dithizone added is measured in a spectrophotometer. (Olesz-kiewicz-Vanderbilt)

SOME METHODOLOGICAL APPROACHES TO THE HYGIENIC STUDY OF TRACE ELE-MENTS IN DRINKING WATER, (IN RUSSIAN), T. A. Nikolaeva, and A. I. Itakova. Vestn Akad Med Nauk SSSR. Vol 27, No 1, p 78-

Vesta Akad sada Nank SSS. Vol 27, No 1, p 76-81, 1972. English summary.
Identifiers: *Water analysis, Human disease,
*Trace elements, Hygiene, Potable water.

Experimental methods for making a hygienic analysis of the trace elements in drinking water are discussed. The health status and disease-incidence among the population related to trace element consumption is discussed.—Copyright 1972, Biological Abstracts and

W73-05872

A MERCURY DETERMINATION METHOD AND ITS USE FOR EXPLORATION IN BRITISH

AND ITS USE FUR EAFLARATION AND BALLIANS COLUMBIA,
Kenneo Explorations, (Western) Ltd., Vancouver (British Columbia).
J. Barakso, and C. Tarnocai.
Canadian Mining and Metallurgical (CIM) Bulletin, p 501-505, April 1970. 6 fig, 2 tab.

Descriptors: "Mercury, "Geochemistry, "Geology, "Analytical techniques, Heavy metals, Metals, Soil, Plants, Trace elements, Mining, Copper, Laboratory tests, Laboratory equipment, Sampling, Testing, Distribution patterns, Canada. Identifiers: "Geochemical explorations.

A method of testing for the mercury content of rocks, soils and plants is outlined. Techniques of sample collecting are described. The procedure involves sulfuric acid and permanganate digestion and oxidation, amalgamation of released mercury on copper foil, and heating of the foil to release the mercury for passage through a mercury detector. Examples are given of mercury determinations in two known mineralized areas in British Columbia - Copper Mountain Mines and Pacific Nickel Mines. The method offers good sensitivity down to 10 ppb and is accurate enough to test any of the soil, rock or plant samples at the background level. The testing apparatus is inexpensive and does not require a highly skilled person to operate it. Two trained people can test 40 samples a day. (Oleszkiewicz-Vanderbilt)

DISTRIBUTION AND CONCENTRATION OF MERCURY IN AUTOPSY SPECIMENS OF HUMAN BRAIN, State Univ. of New York, Buffalo. Dept. of

Anatomy. C. A. Glomski, H. Brody, and S. K. K. Pillay. Nature, Vol 232, p 200-201, July 16, 1971. 5 ref.

Descriptors: "Mercury, "Distribution patterns, "Human pathology, Heavy metals, Trace elements, Metals, Path of pollutants, Human diseases, Analytical techniques, Food chain, Pollutant identification, Great Lakes Region. Identifiers: "Autopsy, "Mercury pollution, "Human brain, Concentrations.

Eight autopsy specimens were selected at random, from subjects who had lived in the area around Buffalo, New York and the adjacent Great Lakes. The brain tissues were analyzed by neutron activation analysis. The white matter of the hemispheres consistently had the lowest levels of mercury in all individuals. This suggests a correlation between anatomical structure and accumulation of the metal. All regions of the brain examined revealed the presence of mercury. Since the observed levels are within the limits of accuracy of the method used, mercury may well be present as a normal constituent of neuronal tissue. Further studies are necessary to confirm this possibility. (Olesz-kiewicz-Vanderbilt)

MERCURY ANALYSIS IN GEOCHEMICAL EX-

PLORATION, Laval Univ., Quebec. Departement de Geologie et

Mineralogie.
L. M. Azzaria, and G. R. Webber.
Canadian Mining and Metallurgical (C.I.M.) Buletia, Vol LXXII, p 126-135, May 1969. 10 fig, 4 tab, 20 ref.

Descriptors: "Mercury, "Geochemistry, "Geology, "Analytical techniques, Heavy metals, Soil, Trace elements, Laboratory equipment, Mineralogy, Geophysics, Surface waters, Sampling, Ultraviolet radiation.

The wide interest in the application of the geochemistry of mercury to mineral exploration is leading to the continued development of a variety of analytical methods for the determination of nallogram quantities of this element. The various methods have different degrees of reliability, somethods have different degrees of reliability, so-phistication and portability. In this investigation, two simple portable instruments were used in geochemical prospecting surveys - an ultraviolet absorption instrument and a similar one modified with gold for the removal of interfering sub-stances. The results show the application of the method to the determination of mercury in soils of different organic content, and in rocks, sulphides and air. The single-beam technique is adequate in prospecting for mercury deposits or in prospecting for other metals if inorganic soil samples are used. The gold-modified instrument is more accurate for soils with organic content although analysis is slower. (Oleszkiewicz-Vanderbilt) W73-05878

ULTRA MICRODETERMINATION OF MERCU-RY IN BIOLOGICAL MATERIALS BY ATOMIC RY IN BIOLOGICAL MATERIALS BY ATOMIC ABSORPTION PHOTOMETRY, Kurume Univ. (Japan). School of Medicine. S. Yamaguchi, and H. Matsumoto. Industrial Medicine, Vol 10, No 3, p 125-133, March 1968. 6 fig, 7 tab, 20 ref.

Descriptors: *Mercury, *Analytical techniques, *Laboratory equipment, *Colorimetry, Metals, Chemical reactions, Pollutant identification, Test-

ing, Sampling. Identifiers: *Atomic absorption photometry.

A review of several colorimetric methods of determination of mercury in biological samples is presented followed by the detailed description of the photometric method developed by the authors. The principle of the method reported is a modification of Yamaguchi and Jacobs' methods (1959-1960) which includes cold incomplete digestion, extensition with diffusions decomposition of the 1960) which includes cold incomplete digestion, extraction with dithizone, decomposition of the mercury dithizonate by heating to produce mercury vapor, and subsequent estimation of the mercury by ultra-violet photometry. The instrument for the analysis is very stable. It easily determines from 0.007 to 2.00 micrograms of mercury with reliable accuracy. (Oleszkiewicz-Vanderbilt) DISTRIBUTION OF MERCURY IN EAST

PACIFIC SEDIMENTS, Miami Univ., Fla. Inst. of Marine and Atmospheric Sciences.

K. Bostrom, and D. E. Fisher.
Geochimica et Cosmochimica Acta, Vol 33, p 743-745, 1969. 1 fig, 6 ref.

Descriptors: "Mercury, "Sediments, "Pacific Ocean, "Analytical techniques, Water pollution, Trace elements, Metals, Path of pollutants, Pollu-tant identification, Laboratory equipment, Laboratory tests, Sampling, Distribution patterns.

Fifty-seven sediments from the Bast Pacific have been analyzed for Hg. All high mercury values are found on the crest of the East Pacific Rise. Either volcanic or absorption processes could explain this distribution pattern. Mercury was analyzed by the vapor discharge technique in which the sample was heated to 500C and the absorbance of Hg-light by the expelled Hg-vapors was measured, with a reproducibility of duplicate samples always better than plus or minus 10 percent. The samples were all surface samples collected during scientific expeditions. (Oleszkiewicz-Vanderbilt)

MEMBRANE PROBE-SPECTRAL EMISSION TYPE DETECTION SYSTEM FOR MERCURY IN WATER,

University of South Florida, Tampa. Dept. of istry.

Analytical Chemistry, Vol 43, No 11, p 1462-1467, September 1971. 6 fig, 2 tab.

Descriptors: "Mercury, "Spectroscopy, "Analytical techniques, Separation techniques, Laboratory tests, Metals, Water pollution, "Pollutant identification, Laboratory equipment, Statistical methods, Sampling, Testing.

A new method for mercury detection and analysis is presented. Mercury compounds are reduced to metallic mercury, diffused into a helium carrier gas stream through a rubber diaphragm immersed in sample solutions and then passed through a dc discharge. The 2537 A mercury emission line inensity is observed. The lower limit of detection is 4 parts per trillion for a concentration sensing probe and is 0.4 nanogram in a batchwise analysis modification of the technique. Since only volatilized mercury diffuses through the diaphragm, both free and total mercury may be determined on the A new method for mercury detection and analysis ized mercury diffuses through the diaphragm, both free and total mercury may be determined on the same sample. Dimethyl mercury is detected. Operating characteristics, calibration, and use of the method for the analysis of some environmental samples are presented. The membrane technique holds promise as a new analytical procedure for volatile materials in solution. (Oleszkiewicz-Van-derbili) W73-05882

AUTOMATED METHOD FOR DETERMINA-TION OF MERCURY, New York State Dept. of Health, Albany. Div. of

Labs, and Research.
B. W. Bailey, and F. C. Lo.
Analytical Chemistry, Vol 43, No 11, p 1525-1526,
September 1971. 2 fig. 2 tab.

Descriptors: "Mercury, "Spectrophotometry, "Absorption, "Analytical techniques, "Automa-tion, Laboratory equipment, Laboratory tests, Sampling, Testing, Separation techniques, Metals, Heavy metals. *Atomic Identifiers: absorption trophotometry.

The generally accepted procedure for determina-tion of trace amounts of mercury is the cold vapor atomic absorption technique originally described by Hatch and Ott. This method, however, is rela-tively time-consuming. Basically, the procedures

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Identification of Pollutants-Group 5A

for the automated method follow the manual version in that the sample is digested to destroy organic matter and get the mercury into solution in the mercuric state. To this solution permanganate is added, followed by hydroxylamine hydrochloride and stanaous caloride. This latter step reduces the mercury to the metal which can then be liberated as a vapor by aerating the solution with air or nitrogen. The absorbance of the mercury vapor so liberated is then measured. The equipment was a Varian Techtron atomic absorption sneetrophotometer model AAS with auto samiton sneetrophotometer model AAS with auto samitons neetrophotometer neetrophotome equipment was a Varian Techtron atomic absorp-tion spectrophotometer model AAS with auto sam-pler, a curve corrector, digital indicator, and digital printer, together with a Technicon Mark II peristaltic action pump. (Oleszkiewicz-Vanderbilt) W73-05883

DETERMINATION OF MERCURY BY A COM-BUSTION TECHNIQUE USING GOLD AS A COLLECTOR, Eastman Kodak Co., Rochester, N.Y. D. H. Anderson, J. H. Evans, J. J. Murphy, and W.

M. White. Analytical Chemistry, Vol 43, No 11, p 1511-1512, September 1971. 1 fig, 4 tab.

Descriptors: "Mercury, "Analytical techniques, "Laboratory equipment, Metals, Heavy metals, Trace elements, Water pollution, Air pollution, Pollutant identification, Laboratory tests, Sampling, Neutron activation analysis, Gold. Identifiers: "Combustion technique, "Atomic ab-sorption spectrophotometry.

A method involving combustion of materials containing mercury and the collection of nanogram quantities of mercury on a thin film of gold is described. The gold is heated at 500 degrees C and the volatilized mercury is determined using resonance absorption of the 253.7-nm wavelength resonance absorption of the 233.7-nm wavelength line with background correction. The detection limit is 0.001 micrograms of mercury. The total time of an analysis for mercury in hair or tissue such as fish is less than 15 minutes. Lengthy acid digestion periods are unnecessary, and the many days of elapsed time involved in neutron activadays or empsed time involved in heutron activa-tion are likewise not needed. Airborne elemental mercury can also be monitored using this collec-tion technique. (Oleskiewicz-Vanderbilt) W73-05884

MERCURY UPTAKE BY SELECTED AGRICUL-TURAL PRODUCTS AND BY-PRODUCTS, Western Regional Research Lab., Berkeley, Calif. For primary bibliographic entry see Field 05B. W73-05885

MERCURY EMISSIONS FROM COAL COM-BUSTION, Environmental Engineering Science, Chestnut

BUSINOS,
Environmental Engineering Science,
Hill, Mass.
C. E. Billings, and W. R. Matson.
Science, Vol 176, p 1232-1233, June 16, 1972. 1
tab, 10 ref.

Descriptors: *Mercury, *Coals, *Thermal power-plants, Air pollution, Powerplants, Heavy metal, Path of pollutants, Gases, Environmental effects. Identifiers: *Mercury pollution.

Mercury liberated during coal combustion can be discharged either as vapor in the flue or retained in the furnace ash. The mercury present in the coal, ash, water from an adjacent river, and effluent gas was measured by anodic stripping voltammetry, and either plasma emission spectrophotometry or neutron activation analysis. About 90 percent (by weight) of the mercury released from a furnace fired with pulverized coal appears to be in the vapor phase, and 10 percent remains with the furnace residual ash. For a 700-megawatt unit, approximately 2.5 kilograms of mercury per day are released. (Oleszkiewicz-Vanderbilt)

ANALYSIS OF SELECTED ELEMENTS IN AT-MOSPHERIC PARTICULATE MATTER BY ATOMIC ABSORPTION, National Air Pollution Control Administration, Cincinnati, Ohio. Div. of Air Quality and Emission

R. J. Thompson, G. B. Morgan, and L. J. Purdue. Atomic Absorption Newsletter, Vol 9, No 3, p 53-57, May-June 1970. 4 fig, 6 tab, 4 ref.

Descriptors: "Heavy metals, "Metals, "Sampling, Air pollution, Lead, Copper, Cadmium, Barium, Manganese, Nickel, Molybdenum, Zinc, Titanium, Cobalt, Caromium, Pollutant identification, Laboratory equipment, Testing. Identifiers: "Particulate matter, "Collection methods, Atomic absorption spectroscopy.

Atmospheric particulate matter is collected for metals analysis on glass fiber filters and membrane filters. These filters are ashed in an oxygen plasma at low temperature obtained by applying a radio frequency voltage to coils surrounding sample chambers, which contain oxygen at low pressure. The sample residue is then extracted with a mixture of nitric and hydrochloric acids. The extracts are then analyzed for selected elements using atomic absorption spectrophotometry. Matrix effects due to both saits and silica can be overcome by dilution and by precipitation of the silica. The efficiency of recovery of known metals added to samples both of atmospheric particulates and of a synthetic particulate was around 86-89%. Analytical data for typical samples are presented. (Oleszeld ata for typical samples are presented. kiewicz-Vanderbilt)
W73-05889

A FLAMELESS ATOMIC ABSORPTION METHOD FOR DETERMINATION OF NANO-METHOD FOR DETERMINATION OF NANO-GRAM QUANTITIES OF MERCURY IN SOLU-TIONS (DIE BESTIMMUNG VON NANO-GRAMM-MENGEN QUECKSILBER AUS LOSUNGEN DURCH EIN FLAMMENLOSES ATOMARES ABSORPTIONSVERFAHREN), Zurich Univ. (Switzerland). H. Brandenberger, and H. Bader. Helvetica Chimica Acta, Vol 50, No 141-142, p 1409-1415, 1967. 7 fig, 2 tab, 12 ref.

Descriptors: "Mercury, "Spectroscopy, "Analyti-cal techniques, Chemical analysis, Laboratory equipment, Separation techniques, Pollutant car techniques, Chemicai analysis, Laboratory equipment, Separation techniques, Pollutant identification. Identifiers: *Atomic absorption spectroscopy, Amalgamation.

A flameless atomic absorption method for the determination of small amounts of mercury in solutions is described. The mercury is amalgamated quantitatively on a copper wire and subsequently vaporized in an absorption cell which is placed in the light path of a commercial atomic absorption instrument. The mercury vapor can be quantitatively determined by its absorption of the 253.7 mm mercury line. The method has a detection limit of 0.2 ng and is therefore about 10,000 times more sensitive than atomic absorption analysis using flame atomization. (Oleszkiewicz-Vanderbilt)
W73-05890

METHYL MERCURY AND INORGANIC MER-CURY COLLECTION BY A SELECTIVE CHELATING RESIN, Bureau of Mines, College Park, Md. College Park Metallurgy Research Center.

S. L. Law. S. Cience, Vol 174, p 285-287, October 15, 1971. 1 fig, 6 ref.

Descriptors: "Mercury, "Ion exchange, "Resins, "Chelation, Analytical techniques, Laboratory tests, Heavy metals, Metals, "Waste water treatment, Water pollution.

Identifiers: "Mercury pollution, Methylmercury, Organomercurials.

A commercially available chelating resin selectively and quantitatively collects methyl mercuric and inorganic mercuric forms of mercury to the exclusion of all other metals studied, except the noble metals. Both forms of mercury can be collected from pH 1 to 9. The rate of collection of inorganic mercury is lower at pH6 than at other pH's. Collected mercury is readily eluted with a slightly acid, 5 percent solution of thiourea, and the resin can be reused for many cycles. Selectivity, pH effects, capacity, and elution characteristics of the resin are described. A resin-loaded paper composed of 50 percent resin and 50 percent cellulose shows properties similar to those of the loose resin. (Oleszkiewicz-Vanderbilt)

COLORIMETRIC DETERMINATION OF MER-CURY RESIDUES ON RICE, Louisiann Agricultural Experiment Station, Baton Rouge, La. Feed and Fertilizer Lab.

Rouge, L.s. Freet and Perturbate Laborators Laborators for the Laborators of Official Agricultural Chemista Journal, Vol 49, p 793-795, 1966. 2 tab, 7 ref.

Descriptors: "Mercury, "Metal organic pesticides, "Rice, "Colorimetry, Pesticide residues, Seed treatment, Foods, Toxicity, Analytical techniques, Laboratory equipment, Toxins, Pungicides, Plant tissue.

Mercury residues at the microgram level are determined in rice by digestion with nitric and perchloric acids; mercury loss by volatilization is prevented by using a packed air condenner. Final determination is made colorimetrically with dithizone. The method is simple; it requires no complex glassware and only minimum of manipulation. It is adaptable for use on other plant and animal tissues. The method can detect 0.1 ppm and greater using a 5 g sample. (Oleszkiewicz-Vanderbilt) W73-05892

ATOMIC ABSORPTION DETERMINATION OF CADMIUM AND LEAD IN WHOLE BLOOD BY

CADMIUM AND LEAD IN WHOLE BLOOD BY A REAGENT-FREE METHOD, National Environmental Research Center, Research Triangle Park, N.C. T. R. Hauser, T. A. Hinners, and J. L. Kent. Analytical Chemistry, Vol 44, No 11, p 1819-1821, September 1972. 1 fig. 3 tab, 12 ref.

Descriptors: *Lead, *Cadmium, *Heavy metals, *Sampling, Separation techniques, Testing, Laboratory tests, Metals, Analytical techniques, Spectroscopy, Spectrometry. Identifiers: *Blood, *Atomic absorption spectroscopy, Clinical studies.

troscopy, Clinical studies.

A method is presented whereby blood can be analyzed for cadmium and lead with relative detection limits of 0.2 ng/ml and 2 ng/ml, respectively. Whole blood was added to a flame-purged tanalum sampling boat, dried in an owen, and ashed in a low temperature asher. Analysis was achieved by directly flaming and ash in the atomic absorption apparatus. Calibration was accomplished by flaming aliquots of metal standard solution in the same sampling boat used for the blood analysis. Recovery of cadmium and lead from spiked blood samples was complete. The analysis of twelve 0.5 ml replicates of one blood sample for cadmium gave a mean of 3.5 ng/ml and a standard deviation of 0.9 gg/ml; for lead, a mean of 213 ng/ml and a standard deviation of 37 ng/ml were obtained. The method offers a 25-fold improvement in detection for the analysis of blood cadmium in comparison to extraction procedures. (Oleazkiewicz-Vanderbilt)

DRY ASHING OF AIRBORNE PARTICULATE MATTER ON PAPER AND GLASS FIBER FIL-

Group 5A-Identification of Pollutants

TERS FOR TRACE METAL ANALYSIS BY ATOMIC ABSORPTION SPECTROMETRY, Bell Telephone Labs., Inc., Murray Hill, N.J. T. Y. Kometani, J. L. Bove, B. Nathanson, S. Siebenberg, and M. Magyar. Environmental Science and Technology, Vol 6, No 7, p 617-620, July 1972. 7 tab, 12 ref.

Descriptors: "Heavy metals, "Sampling, "Copper, "Zinc, "Lead, "Cadmium, Filtration, Air pollution, Trace elements, Metals, Pollutant identification, Laboratory equipment, Testing, Path of pol-

Identifiers: *Airborne particulate matter, *Atomic absorption spectrometry, Particulate matter

Particulate air pollutants collected on paper filters can be dry ashed at 500 degrees C without serious loss of trace metals by volatilization. Conversion of metal salts to sulfates by the addition of H2SO4 of metal salts to sulfates by volatilization. Conversion of metal salts to sulfates by the addition of H2SO4 prior to dry asking ensures virtually complete recovery of the metals tested. Losses reported during dry asking of particulate matter collected on glass filters are not necessarily ascribable to volatilization as has commonly been supposed. Metals such as Pb, Zn, Cu, and Cd react to varying extents with glass at high temperature to form insoluble metal silicates. Comparative studies of particulate matter collected on paper filters in New York City indicate that the results obtained by dry ashing compare favorably with those of accepted methods such as wet ashing and low-temperature ashing. Good recoveries of Pb, Cu, Zn, and Cd from NYC samples were obtained by dry asking at 500 degrees C for 1 hr even without the prior use of H2SO4. (Oleszkiewicz-Vanderbilt)

A SIMPLE TEST FOR ESTIMATING PREE CHLORINE,

Ames Co., Elkhart, Ind. R. Bauer, B. E. Phillips, and C. O. Rupe. Journal of the American Water Works Associa-tion, Vol 64, No 11, p 787-789, November 1972. 2 fg, 4 tab, 7 ref.

Descriptors: "Chlorination, "Chlorine, Disinfec-tion, "Indicators, Testing, Testing procedures, "On-site tests, Laboratory tests, Ureas, Nitrogen, Nitrogen compounds, Pollutant identification. Identifiers: Chloramines, "Syringaldazine, Uric acid, Cyanuric acid.

acid, Cyanuric acid.

Since contaminated waters usually contain many types of chlorine-binding materials, the estimation of the sanitary conditions by determining total chlorine is unreliable. A more meaningful procedure is to measure the active component free chlorine. Syringaldazine has been found to react with free chlorine and not with chloramines. Its application to paper strips has produced a compact, convenient test system for measuring free chlorine, which is equally applicable to laboratory and field use. With chlorine concentrations of 2 ppm or greater, sufficient color is produced to permit the use of a simple dip-and-read type of test. In waters containing less than 2 ppm, the color produced is too faint for good comparison. By means of a wicking device, more chlorine can be brought into contact with the indicator, thus enhancing color production to the point where 0.2 to 2 ppm free chlorine can be estimated. (Campbell-NWWA)

SURFACE-WATER INVESTIGATIONS AT BAR-ROW, ALASKA, Geological Survey, Anchorage, Alaska. For primary bibliographic entry see Field 07C. W73-05971

HYDROLOGIC CONDITIONS DURING 1971 IN DADE COUNTY, FLORIDA, Geological Survey, Tallahasee, Fla. For primary bibliographic entry see Field 02A.

W73-05980

GAS CHROMATOGRAPHIC ANALYSIS OF COMPLEX DEUTERATED AND TRITIATED MIXTURES WITH PACKED COLUMNS, Consiglio Nazionale delle Ricerche, Rome (Italy). F. Bruner, P. Ciccioli, and A. Di Corcia. Analytical Chemistry, Vol 44, No 6, p 894-898, May 1972. 5 fig. 1 tab, 20 ref.

Descriptors: "Gas chromatography, "Organic compounds, "Tritium, "Deuterium, Laboratory equipment, Tracers. Identifiers: Sample preparation, Essential oils, Terpenes, Packed columns.

A rather simple gas chromatographic technique has been developed for the analysis of partially deuterated and tritiated mixtures of hydrocarbons. High efficiency packed columns of about 100 m in length and 130,000 theoretical plates were employed to separate isotopic mixtures with tritium, as they were originated by the reaction between propene and HT in the presence of catalysts. Separations were carried out at easily controllable temperature, such as OC and -78C. Aithough the analyses were conducted with ethane and propane, it is speculated that the method is applicable to other hydrocarbons such as essential oils. (Little-Battelle)

EVALUATION OF METHODS FOR ESTIMAT-ING BIOCHEMICAL OXYGEN DEMAND PARAMETERS,

FARAMETERS, CH2M/Hill, Corvallis, Oreg. D. M. Marske, and L. B. Polkowski. Journal Water Pollution Control Federation, Vol 44, No 10, p 1987-2000, October 1972. 10 fig, 4 tab, 10 ref, 1 append.

Descriptors: "Biochemical oxygen demand, "Evaluation, "Estimating equations, "Methodology, Least squares method, Statistical methods, Reliability. Identifiers: Reed and Teriault method, Log difference method, Method of moments, Thomas slope method, Precision.

slope method, Precision.

Biochemical oxygen demand (BOD) is the amount of oxygen required by aerobic microorganisms to stabilize the organic material of waste water, waste water treatment plant effluent, polluted water, or industrial waste. BOD is proportional to the amount of organic material present and, therefore, is a measure of the strength of the waste. Evidence is offered of the quality of methods used to (1) estimate L (amount of 02 required to stabilize the carbonaceous organic matter in a waste) and k (a constant indicating the rate of decomposition) of the first-order or mono molecular expression describing the BOD curve. The adequacy of the formulae used to describe the BOD versus time relationship is evaluated. A new statistical tool, the sum of squares surface, was used to evaluate several methods. Methods studied included: the Reed and Theriault method, the log-difference method, the methods of moments, the Thomasslope method, and least squares estimate. Final analysis was tabulated such that the methods were ranked according to preference, based on reliability, accuracy, and computation ease. (Mackan-Battelle) telle) W73-06008

METALS AS POLLUTANTS IN AIR AND

Ocean Engineering Information Service, La Jolla, Calif. B. Sinha.

Ocean Engineering Information Series Vol 6, 1972.

Descriptors: *Metals, *Air pollution, *Water pollution, *Bibliographies, *Abstracts, *Documenta-

tion, Pollutants, Air pollution effects, Water pollu-tion effects, Water pollution sources, Pollutant identification, Water pollution control, Public health, Methodology, Instrumentation, Analytical techniques, Path of pollutants, Pollution abate-

ment. Identifiers: Detection, Ash, Arsenic, Barium, Cyanides, Selenium, Tin, Chelating agents, Lithium, Silver, Vanadium.

This bibliography contains 583 informative abstracts of the worldwide literature providing substantial scientific and technological information on: detection, analysis and measurement of metals as pollutants in air and water; domestic, industrial, urban and other sources; the biogeochemical and meteorological processes involved in the distribution of the pollutants; effects on: human health, experimental and test animals, and various other life forms; and standards and controls. In addition to a bibliography of bibliographies, a keyterm index supplements a detailed subject outline. It is intended as an interdisciplinary guide to studies of metals as pollutants. (Synder-Battelle) W73-06009

MICROFLORA OF ACTIVATED SLUDGE, Massey Univ., Palmerston North (New Zealand). Dept. of Biotechnology. S. Ueda, and R. L. Earle. Journal of General and Applied Microbiology, Vol 18, No 3, p 239-248, June 1972. 2 fig. 6 tab, 21 ref.

Descriptors: "Activated slude, "Sewage bacteria,
"Assay. "Pollutant identification, "Isolation,
Sewage aludge, Aerobic bacteria, Enteric bacteria,
Aquatic bacteria, Soil bacteria, Separation
techniques, Methodology, Polymers, Chemical
oxygen demand, Pseudomonas, Coliforms, Cul-

oxygen demand, Pseudomonas, Comorms, Catures.
Identifiers: *Substrate utilization, Heterotrophic bacteria, Flocculent bacteria, Chemical composition, Sugars, Glucose, Zoogloea spp, Pure cultures, Pentose, Glucuronic acid, Pseudomonas incognita, Pseudomonas olevorans, Pseudomonas poreopolis, Pseudomonas ochracea, Pseudomonas pseudomallei, Pseudomonas rugosa, Vibrio percolans, Escherichia intermedia, Aerobacter aerogens, Aerobacter doacae, Achromobacter pestifer, Brevibacterium insectiphilium, Brevibacterium fulvum, Paracolobactrum aerogenoides.

Fifty-four bacterial strains were isolated from the final settling tank of the Tongariro National Park Activated Sludge Plant. Of these, only 4 strains were capable of forming floc in proteose peptoneyeast extract (PPYE) but 6 strains of Pseudomonas sp. produced floc in synthetic sewage. The activated sludge was easily reconstructed by mixing the isolated bacteria at random. The chemical oxygen demand (COD) removal activities of mixing the isolated bacteria at random. The chemical oxygen demand (COD) removal activities of these reconstructed sludges were twice as much as that of the original activated sludge. The reconstructed activated sludges from the pure cultures had almost the same activity as the original activated sludge. Sugar components, from NH3-extracted fraction of the activated sludge polymer, were mainly glucose and minor quantities of pentose and glucuronic acid; but those from EDTA-extracted fraction were mainly glucuronic acid and small amount of glucose and pentose. (Holoman-Battelle)

FLUORESCENCE SPECTROMETRY IN THE CHARACTERIZATION OF HIGH-BOILING PETROLEUM DISTILLATES,

Bureau of Mines, Laramie, Wyo. Laramie Energy Research Center. J. F. McKay, and D. R. Latham. Analytical Chemistry, Vol 44, No 13, p 2132-2137, November 1972. 7 fig, 1 tab, 18 ref.

Descriptors: *Pollutant identification, Organic compounds, Separation techniques, Methodology,

Aromatic compounds, Anion exchange, Chemical

Aromatic compounds, Anion exchange, Chemical analysis.

Identifiers: *Petroleum distillates, *Fluorescence spectrophotometry, *Characterization, *Qualitative analysis, Boiling point, Fluorescent spectry, Fluorescence emission, Fluorescence excitation, Alkenes, Olefins, Crude oil, Aliphatic hydrocarbons, Aromatic hydrocarbons, Chemical composition, Ion exchange chromatography, Gel permeation chromatographs, Thin layer chromatography, Carbazoles, Ion exchange resins, Chrysenes, Phenathrenes, Perylenes, Anthracenes, Fluorenes, Ovalene, Fluoranthene, Benz (a) anthracenes, Coronenes, Picenes, Infrared spectrophotometry.

Fluorescence spectrometry is a qualitative analytical technique which can be useful in the characterization of high-boiling petroleum distillates. The fluorescence emission and fluorescence excitation spectra have been obtained for acid concentrates of 400-500 C. Among the compound types identified were carbazoles, 11H-benzo (a)carbazoles, 7H-benzo (c)carbazoles, perylenes, coronenes, benzo- (ghi)perylenes, benzo- (a)anthracenes, and chrysenes. Fluorescence and excitation peak maxima of 35 aromatic model compounds are reported. The separation scheme which produced samples suitable for fluorescence analysis involved the use of ion exchange chromatography, gel permeation chromatography, and thin-layer chromatography. (Holoman-Battelle) W73-06012

ANALYTICAL STUDY OF ANALYTICAL STUDY OF THE PHOSPHOREDENCE OF PURINES IN AQUE-OUS SOLUTION AT 77 DEGREE K, Florida Univ., Gainesville. Dept. of Chemistry. J. J. Aaron, and J. D. Winefordner. Analytical Chemistry, Vol 44, No 13, p 2127-2131, November 1972. 5 fig. 3 tab, 20 ref.

Descriptors: *Chemical analysis, *Pollutant identification, *Aqueous solutions, Chemical properties, Spectroscopy, Organic compounds, Physical properties. Identifiers: "Phosphorescence, "Purine, "Phosphorimetry, "Quantitative analysis, Detection limits, Biochemical analysis, toon limits, Biochemical analysis, Phosphorescence spectra, Organic bases, Detection limits, Ultraviolet absorption, Ultraviolet spectra, Adenine, 6-Aminopurine, 6-Methylpurine, 6-Methylmercaptopurine, 6-Benzylaminopurine, 6-Chloropurine, 6-Bromopurine, 2-Amino-6-methylmercaptopurine, 2-6-Diaminopurine.

methylmercapiopurine, 26-Diaminopurine.

A study was conducted whereby the phosphorescence characteristics for a series of purines in rigid aqueous solution were shown to be useful for their identification, and phosphorimetry was shown to be useful for the quantitative measurement of these compounds. Phosphorescence excitation and emission spectra, life-times, and hosphorimetric analytical curves and limits of detection have been determined at 77 degree K in methanol/water solution for purine and 8 of its derivatives. The substituted purines studied include amino, methyl, methylmercapto, benzylamino, chloro, and bromo substituents in either the 6- or the 2,6-position on the pyrimidine ring. The fine structure of phosphorescence spectra is valuable for the identification of purine derivatives. Analytical curves are linear over large concentrations ranges (1,00 to 100,000 concentration units). Because of the high phosphorescence yields of purines, very low limits of detection between 0.1 and 0.0002 microgram/ml were obtained. Absolute limiting detectable quantities of purine and the 8 derivatives are in the picogram range (3 nanograms - 4 picograms). Because of the excellent precision, sensitivity, and broad range of linear response, phosphorimetry can be considered as the most versatile analytical method to date for the direct quantitative determination of purines. (Holoman-Battelle)

PHOSPHORESCENCE STUDY OF EXCITED TRIPLET STATE PROPERTIES OF SOME K
VITAMINS AND THEIR ANALYTICAL USE.

FULNESS, Florida Univ., Gainesville, Dept. of Chemistry. For primary bibliographic entry see Field 02K. W73-06014

SECONDARY ION MASS ANALYSIS: A TECHNIQUE FOR THREE-DIMENSIONAL CHARACTERIZATION, Illinois Univ., Urbana. Materials Research Lab. For primary bibliographic entry see Field 02K. W73-06015

AQUATIC-BIOTIC COMMUNITY STRUCTURE AQUATIC-BIOTIC COMMUNITY STRUCTURE AS AN INDICATOR OF POLLUTION, Geological Survey of Alabama, University. G. G. Dills, and D. T. Rogers, Jr. Available from the National Technical Informa-tion Service as PB-216 801; 33.00 in paper copy, 30.95 in microfiche. Geological Survey of Alabama Circular 80, June 1972. 25 p, 5 fig, 4 tab, 53 ref. OWRR A-022-ALA (1). 14-31-0001-3201.

Descriptors: Aquatic life, Pollutant identification, Community structure, Statistical analysis, Biologi-cal communities, Water pollution effects, Acid mine water, Benthic fauna, Aquatic animals, In-dicators.

Physicochemical conditions and benthic macroinvertebrate community structure were quantitatively related to varying degrees of acid mine drainage in a small stream system. Tributaries exposed to acid effluents were characterized by lack of anatural buffering capacity, a reduction in turbidity, a decrease in pH, and an increase in mineral content. Strong positive correlation existed between hardness, iron, manganese, pH, conductance, and sulfer, while dissolved-oxygen content and temperature values were strongly negatively correlated. A step-wise regression analysis showed pH, phosphate, and turbidity to be highly correlated (P less than 0.01) with species diversity. Significant differences (P less than 0.01) in species diversity existed between acidic and nonpolluted tributaries. Stations located near areas of acid production were consistently lowest in diversity. Species diversity values for the unpolluted stations showed temporal variations with highest values occurring during late March and December. The polluted stations showed random fluctuations in diversity values. A regression line, calculated to show the relationship between pH and species diversity, could be used to predict species diversity on the basis of periodic measurement of stream pH. Varying degrees of acid mine pollution were effected by changes in the macroinvertebrate community structure. Physicochemical conditions and benthic macroin-

THE DEVELOPMENT OF AN INSTRUMENTAL COMBUSTION METHOD FOR THE RAPID DETERMINATION OF TOTAL PHOSPHORUS IN AQUEOUS SOLUTIONS, Michigan State Univ., East Lansing. Inst. of Water Personal

Available from National Technical Information Service as PB-216 803; \$3.00 in paper copy, \$0.95 in microfiche. Project Completion Report, January 1973. 67 p. 12 fig. 50 ref. OWRR A-033-MICH (1). 14-31-01-0001-3022.

Descriptors: "Phosphorus, "Aqueous solutions, "Organic compounds, "Analytical techniques, Pollutant identification, Instrumentation. Identifiers: "Instrumental combustion, "Phosphine, Cesium thermionic detector.

An instrumental combustion method was designed for the rapid determination of milligram quantities of phosphorus in aqueous solutions. With this technique both inorganic and organic phosphorus

compounds are reduced to phosphine in an hydrogen atmosphere at 920 C. The phosphine is separated from other combustion products on a chromatographic column and measured by a cesium thermionic detector with the signal transmitted to a potentiometric recorder. The method requires microliter samples and the minimum detectability of the system is in the range of 0.1 to 0.2 micrograms (approximately equivalent to 100 to 200 miligrams per liter) as phosphorus. The analysis time per sample is less than 10 minutes.

DEVELOPMENT OF A METHOD TO DETER-MINE ORTHO, PYRO, AND TRIPOLY--PHOSPHATE IN SEDIMENT, Missouri Water Resources Research Center, Columbia.

Columbia.
R. W. Blanchar, and D. Riego.
Available from the National Technical Information Service as PB-216 603, 33.00 in paper copy, 30.95 in microfiche. Missouri Water Resources Research Center, Completion Report, January, 1973. 50 p. 14 fig. 8 tab, 7 ref. OWRR B-051-MO (1), 14-31-0001-3605.

Descriptors: *Sediments, Detergents, *Phosphates, *Analytical techniques, Soil contamination, *Pollutant identification. Identifiers: Polyphosphates, Pyrophosphates, Tripolyphosphates.

Amethod to determine pyrophosphate (PP) and tripolyphosphate (TPP) in sediments was developed. Sediment was extracted with 2% EDTA + 10.1M NIH4F followed by a second extract of 2% EDTA + 1N NsOH, orthophosphate (OP), PP, AND TPP were separated by anion exchange chromotography, and the fractions collected and P determined after extraction into isobutanol. The limit of detection of the method was 0.5 microgram P/g sediment. Fourteen sediments were tested and the highest TPP found was 1.8 microgram P/g sediment. Thirteen of the sediment samples contained less than 1 microgram P/g as TPP. Only 3 of 14 samples contained less than 1 microgram P/g as PP. The highest level of PP found in sediment was 8.5 microgram P/g, from an animal gram P/g as PP. The highest level of PP found in sediment was 8.5 microgram P/g, from an animal waste lagoon. Estimates of error and reproducibili-ty were made from analysis of samples with added PP and TPP. The error for samples containing 36.9 microgram P/g as PP was plus or minus 7.9, and for TPP at 12.3 microgram P/g the error was plus or minus 3.3. The absolute value for PP overesti-mated by 4.5% and TPP underestimated by 41%. W73-66035

SUITABILITY OF PREEZING AS A METHOD OF PRESERVING RUNOFF SAMPLES FOR ANALYSIS OF SOLUBLE PHOSPHATE, Purdue Univ., Lafayette, Ind. Dept. of Agronomy. D. W. Nelson, and M. J. M. Romkens. Journal of Environmental Quality, Vol 1, No 3, p 323-324, July/September, 1972. 2 tab, 8 ref.

Descriptors: "Phosphates, "Storm runoff, "Sampling, "Freezing, Water pollution sources, Water pollution control, Water quality control, Pollutant identification, Sediments. Identifiers: "Orthophosphates.

Slow freezing of surface runoff samples decreased the levels of soluble orthophosphate in the water phase by 2% to 27%; however, low temperature storage at 2C for 3 days or freezing of the water storage at 2C for 3 days or freezing of the water phase after sediment removal did not change the orthophosphate concentrations. After it was discovered that rapid freezing also resulted in a decrease in orthophosphate concentration, it was concluded that freezing is a poor method to be used in this instance unless the sediment is removed before freezing. (Smith-Texas) W73-06041

Group 5A-Identification of Pollutants

SIMPLE MEASUREMENT TECHNIQUE FOR SOLUBLE BOD PROGRESSION, Rice Univ., Houston, Tex. Dept. of Environmen-tal Science and Engineering. P. L. D'Alessandro, and W. G. Characklis. Water and Sewage Works, Vol 119, No 9, p 106-107, September, 1972. 4 fig, 5 ref.

Descriptors: *Biochemical oxygen demand, *Waste water treatment, *Water treatment, Sampling, Industrial wastes, Municipal wastes, Hydrogen ion concentration.

A Hach Manometer BOD Apparatus was used to measure oxygen uptake which in turn was used as an indirect measurement of biodegradable, soluble carbon. Varying concentrations of a synthetic waste monitored by this device during BOD progression were compared to primary effluent from a municipal waste treatment plant. The results indicate the method to be a simple, reliable technique. The data obtained are also useful for process assessment and estimating process oxygen requirements. (Smith-Texas)

ADENOSINE TRIPHOSPHATE IN LAKE SEDI-

MENTS, Wisconsin Univ., Madison. C-C. Lee. Available from University Microfilms 300 N. Zeeb Rd. Ann Arbor, MI 48106, Order No. 71-5650. Ph.D. Dissertation, 1971. 109 p.

Descriptors: *Bioluminescence, *Phosphates, *Bioassay, *Lake sediments, Algae, *Wisconsin, Soils, Nutrient requirements, Ion Exchange, *Chaption *

Theoretical considerations as well as experir results of a modification of the lucifern-luciferase bioluminescence technique for determining ATP in sediments indicate that this method should be an seuments indicate that this method should be applicable to soils as well as sediments. The origin and significance of ATP contents in lake sedi-ments from nine lakes in Wisconsin were evaluments from aine lakes in Wisconsin were evaluated using the H2SO-4-exchange resin, biotuminescence technique for ATP determination. It was concluded that although ATP may provide a valid appreximation of S. capriconutum growth in bioassay systems, precise conversion of ATP to living algal cell material necessitates consideration of the effect of the nutrient deficiencies on the algal ATP pool. (Gottschalk-Texas)

THE PRESENT AND FUTURE ROLE OF IN-STRUMENTATION IN WATER POLLUTION

For primary bibliographic entry see Field 05G. W73-06071

RAPID DETECTION SYSTEM FOR OR-GANOPHOSPHATES AND CARBAMATE IN-SECTICIDES IN WATER. Midwest Research Inst., Kansas City, Mo. Life

Copy available from GPO Sup Doc as EP1.23/2 (72-010), \$0.95; microfiche from NTIS as PB-214 764, \$0.95. Environmental Protection Agency, Technology Series Report EPA-R2-72-010, August 1972. 66 p, 15 fig, 7 tab, 18 ref. Contract 68-01-0038. EPA Project 15090 GLU.

Descriptors: *Pesticide toxicity, *Organophosphates, *Carbamate pesticides, Enzymes, Pollutant identification, Instrumentation, *Lethal limit, *Monitoring, *Insecticides.

Identifiers: Malathion, Parathion, Azodrin, Sevin, Dimetilan, *Cholinesterase Antagonist Monitor, DDVP, Anticholinesterases, *Enzyme detector.

DDVP, Anticholinesterases, *Enzyme detector.

An apparatus for the detection and monitoring of water supplies for hazardous spills of organophosphate and carbamate insecticides has now been designed and fabricated. The new unit is called the Cholinesterase Antagonist Monitor, CAM-1, because it produces an alarm in 3 min when toxic or subtoxic levels of cholinesterase antagonists are present in water. Response of this apparatus to subtoxic levels of azodrin, sevin, dimetilan, malathion, parathion and DDVP has already been demonstrated. CAM-1 uses immobilized cholinesterase for the collection of cholinesterase for the collection of cholinesterase for the collection of cholinesterase inhibitors from the water supplies is determined automatically in an electrochemical sued to automate the detection process and to signal an alarm when there is a rapid loss of enzyme activity—a situation which occurs in the presence of organophosphate and carbamate insectides in the water sampled. (EPA)

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS: A PROGRESS RE-PORT, National Sanitation Foundation, Ann Arbor,

National Samiation Foundation, Ann Arbor, Mich.
N. I. McClelland, and K. H. Mancy.
Journal of the American Water Works Association, Vol 64, p 795-803, December 1972. 8 fig. 1 map, 13 photo, 4 tab.

Descriptors: "Water treatment, "Water analysis, "Water pollution treatment, "Water utilization, Water quality control, Industrial plants, Quality control, Water pollution, Instrumentation, Chemical analysis, Equipment, On-site tests, Measurements, Water quality.

Progress made on the National Sanitation Founda-tion (NSF) Water Quality Monitoring Project is summarized. Specific aims of the project included: (1) developing new sensor systems; (2) establish-ing the analytical feasibility of commercially available sensors for potable-water-quality moni-toring applications; and (3) evaluating the per-formance characteristics of each sensor in the system under laboratory and field conditions. Con-sidered in the study were: (1) ion-selective elec-trodes, (2) a hardness electrode, (3) a robot moni-tor, (4) a light-scatter turbidimeter, and (5) a free-residual-chlorine analyzer. At the NSF laboratory, a prototype potable-water-quality monitor has been measuring certain parameters, which are specified. (Reed-Florida) W73-06126

IDENTIFICATION SYSTEM FOR WATER POL-LUTION DETECTION,

E. L. Greenwood. U.S. Patent No. 3,691,983,6 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 3, p. 907, September 19, 1972.

Descriptors: *Patents, *Water pollution sources, *Pollutant identification, Pollutants, Pollution abatement, *Waste water disposal, Waste water. Identifiers: *Prevention, *Pollution prevention, *Water pollution prevention.

To serve as an effective deterrent to unauthorized discharge of polluting material, it is suggested that this system be made compulsory. Buoyant indicator elements would be discharged along with the discharged material. These would positively identify the source. The indicator elements consist of buoyant pellets having indicia which identify their source. The pellets are provided with absorptive cores to serve as carriers identifying the discharged material. (Sinha-OEIS)

W73-06134

HYDROCARBON GASES PRODUCED IN A SIMULATED SWAMP ENVIRONMENT, Bureau of Mines, Pittsburgh, Pa. Pittsburgh Mining and Safety Research Center. For primary bibliographic entry see Field 02K. W73-06178

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS, URS Research Co., San Mato, Calif. For primary bibliographic entry see Field 05B. W73-06212

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, LOUI-SIANA: PHASE II, HYDROLOGY, Louisiana Wild Life and Fisheries Commission, New Orleans.

B. B. Barrett, J. W. Tarver, W. R. Latapie, J. F. Pollard, and W. R. Mock.
Available from the National Technical Information Service as COM-72-11306, \$3.00 in paper copy, \$0.95 in microfiche. 1971. p 1-130, 38 fig, 49 tab, 21 ref.

Descriptors: "Hydrologic data, "Estuaries, "Louisiana, "Water quality, Chemical analysis, Dissolved oxygen, Salinity, Turbidity, Nutrients, Phosphates, Nitrates, Tides, Atmospheric pressure, Rainfall, Wind velocity, Temperature, Streamflow, Discharge measurement, Coasts, Water levels, Data collections, Gulf of Mexico.

Water levels, Data collections, Gulf of Mexico.

Louisiana's estuaries from Sabine Lake to the Pearl River were sampled at 109 stations during 1968 and 1969. Salinity and water temperature were measured at all stations; dissolved oxygen, turbidity, and the nutrients nitrate, nitrite, inorganic phosphate, and total phosphorus were sampled at 82 stations. Tide, barometric pressure, rainfall and wind speed and direction were measured at one station. Coastwide data on air temperature, precipitation, and stages and discharges of the principal rivers were also collected. In general, Louisiana's estuaries and near offshore waters are low in aslinity and high in nutrient concentrations as compared with other states bordering the northern Gulf of Mexico. These characteristics are due primarily to Louisiana's shigh rainfall and the large volume of river water which makes its way through rich alluvial soils to the Gulf of Mexico. The major contributors of nutrients to the estuaries are the Mississippi and Atchafalaya Rivers. These rivers are also responsible for major salt water dilutions within the coastal area and in the near offshore waters. The data are summarized in maps, tables, and graphs. (See also W73-05673) (Woodard-USGS)

A METHOD FOR RAPID AND RELIABLE SCRAPING OF PERIPHYTTON SLIDES, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 07B. W73-06223

A SURVEY OF THE SELENIUM CONTENT OF FISH FROM 49 NEW YORK STATE WATERS, Cornell Univ., Ithaca N.Y.; and New York State Coll. of Agriculture, Ithaca, N.Y. I. S. Pakkala, W. H. Gutenmann, D. J. Lisk, G. E. Burdick, and E. J. Harris. Pesticides Monitoring Journal, Vol 6, No 2, p 107-114, September 1972. 1 fig, 4 tab, 13 ref.

Descriptors: *Freshwater fish, *Anadromous fish, *Brackish-water fish, *Saline water fish, *New York, Lakes, Rivers, Separation techniques, Sampling, Cold-water fish, Marine fish, Pollutant identification, Lake trout, Bullheads, Brook trout, Brown trout, Channel catfish, Carp, Cisco,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants-Group 5A

Drums, Perches, Rainbow trout, Rock bass, Striped bass, White bass, Lake Erie, Lake Ontario, St. Lawrence River, Hudson River. Identifiers: "Selenium, Chalcogens, Sample preparation, Chemical recovery, Detection limits, Black crappie, Bowfin, Ictalurus spp, Burbot, Chain pickerel, Coho admon, Gizzard shad, Goldfish, Lake whitefish, Largemouth bass, Northern pike, Smallmouth bass, Splake, Sturgeon, White sucker, Oxygen flask combustion.

flask combustion.

A survey was made of the seleaium content of 438 fish of various species collected in 1969 from 49 New York State waters and a group of lake trout sampled in 1970 from Cayuga Lake only, Decapitated, eviscerated fish were chopped, mixed, and frozen in polyethylene bags prior to analysis. Selenium was determined by an adaptation of the Allaway and Cory method involving oxygen-flask combustion of dried fish and the determination of the fluorescence of the selenium 2,3-dianinonaphthalene complex. The method was sensitive to about 0.1 ppm of Se in fish. Concentrations of selenium on a freshweight basis were cusually below 1 ppm. There was little apparent correlation between selenium concentrations and species or sampling locations except that sturgeon from the Hudson River, lake trout from Lakes George and West Canada, whitefish from Raquette Lake, and several species from Lake Pleasant had consistently higher levels of selenium than other samples; all fish from Lakes Butterfield and Champiain and the Chenango and Salmon Rivers had consistently lower levels. No correlation was apparent between selenium levels and size or sex of fish. Selenium did not appear to be cumulative in lake trout of known age up to 12 years from Cayuga Lake. (Holoman-Battelle)

TOTAL MERCURY IN LARGEMOUTH BASS (MICROPTERUS SALMOIDES) IN ROSS BAR-NETT RESERVOIR, MISSISSIPPI - 1970 AND

1971,
Mississippi Univ. Dept. of Biology.
L. A. Knight, Jr., and J. Herring.
Pesticides Monitoring Journal, Vol 6, No 2, p 103106, September 1972. I fig. 3 tab, 13 ref.

Descriptors: "Mercury, "Heavy metals, "Chemical analysis, "Pollutant identification, "Bass, Bioassay, "Mississippi, Data collections, Freshwater fish, Pan fish, Sunfishes. Identifiers: Micropterus salmoides, "Atomic absorption spectrophotometry, "Muscle, "Ross Barnett Reservoir, Sample preparation, Animal tissues, Chemical digestion.

Total mercury in 73 largemouth bass, Micropterus salmoides, from Ross Barnett Reservoir, Mississippi, was measured by atomic absorption spectrophotometry. Samples of flesh from the trunk region below the dorsal fin and above the lateral line were mechanically chopped and mixed in a blender and subsamples were dissolved in a mixture of concentrated nitric and suffuric acids and diluted with distilled water. After cooling the samples to room temperature, an aliquot was reduced. ple to room temperature, an aliquot was reduced using 10 percent stannous sulfate and placed in the absorption system. Standards were run similarly. The fish analyzed were collected between November 1970 and October, 1971, at intervals of the collected between the The IISN analyzed November 1970 and October, 1971, at intervals representing winter, spring, summer, and fall; specimens ranged in weight from 0.10 to 3.15 kg. Fish contained from less than 0.05 to 0.74 ppm total mercury; levels generally increased with weight of the fish. (Holoman-Baitelle) W73-06265

ORGANOCHLORINE INSECTICIDE RESIDUES IN WATER, SEDIMENT, AND ORGANISMS, ARANSAS BAY, TEXAS - SEPTEMBER 1969 -JUNE 1970, Texas Christian Univ., Fort Knox. Dept. of Biolo-

R. R. Fay, and L. W. Newland. Pesticides Monitoring Journal, Vol 6, No 2, p 97-102, September 1972. 1 fig, 4 tab, 10 ref.

102, September 1972. I fig. 4 tab, 10 ref.

Descriptors: "Water analysis, "Soil analysis, Aquatic soils, "Chlorinated hydrocarbon peaticides, "Peaticide residues, Marine animals, "Pollutant identification, Bioassay, Water sampling, Crustaccans, Mollusks, Heptachlor, Aldrin, Diedrin, Badrin, Marine fish, Salinity, Hydrogen ion concentration, Organic matter, Sediments, "Texas, Organic compounds, Organic pesticides, Shrimp, Oysters, Gas chromatography, DDB, DDD, DDT, Solvent extractions, Drums, Crabs, Silversides, Minnows, Brown trout. Identifiers: "Aransas Bay, Electron capture gas chromatography, Gamma-BHC, Heptachlor epoxide, Chemical recovery, p p" DDD, p p" DDT, p DDE, Sample preparation, Gas liquid chromatography, Sea trout, Croakers, Column chromatography, Organic solvents, Muscle, Intestine, Eggs, Cleanup, Cynoscion arenarius, Pogonias cromis, Crassostrea virginicia, Callinocets sapidis, Menidia menidia, Bairdella chrysura, Trichiurus lepturns, Penaeus aztecus.

The presence and distribution of organochlorine insecticide residues of Aransas Bay and its contributing bays at Rockport, Texas were determined. A total of 80 water samples, 29 sediment samples, and 11 samples of 8 different types of organisms were collected and analyzed from September, 1969 through June, 1970. Organochlorine insecticide residues were detected in only 3 water samples and a sediment samples and, although residues were detected in 8 of the 11 organism samples, these were all at low levels (less than 67 ppb). The predominant residues found in the organisms were dieldrin, p, p'-DDD, and p, p'-DDE. The occurrence of concentration of residues could not be related to salinity or pH of the water or percent organic content of the sediments. (Holoman-Battelle) W73-06266 W73-06266

COMPARATIVE ORGANOCHLORINE PESTI-CIDE RESIDUES IN SERUM AND BIOPSIED LI-POID TISSUE: A SURVEY OF 266 PERSONS IN SOUTHERN IDAHO - 1976, Idaho State Dept. of Health, Boise. Idaho Commu-nity Study on Pesticides. J. Wyllie, J. Gabica, and W. W. Benson. Pesticides Monitoring Journal, Vol 6, No 2, p 84-88, September 1972. 4 fig. 3 tab, 22 ref.

Descriptors: "Chlorinated hydrocarbon pesticides, "Pesticide residues, Methodology, "Pollutant identification, 'Chemical analysis, Organic pesticides, Halogenated pesticides, DDT, Gas chromatography, Dieldrin, DDD, DDE, Organic compounds, Solvent extractions, "Idaho. Identifiers: "Adipose tissue, "Electron capture gas chromatography, "Thin layer chromatography, "Human serum, Sample preparation, Chemical recovery, Animal tissues, p.p.' DDT, p.p. DDE, p.p. 'DDD, Heptachlor epoxide, o.p.' DDT, Beta-BHC, Serum, Organic solvents.

Paired samples of serum and adipose tissue from patients undergoing abdominal surgery were stu-died in order to determine residue levels of ordied in order to determine residue levels of organochlorine pesticides in the two tissues. The
serum samples were extracted for organochlorine
insecticides by a revised Dale-Cueto triple hexane
extraction method: (1) Some serum was combined
with nanograde hexane containing an aldrin internal standard and agitated for 3 min on a vortex
mixer. (2) The mixture was centrituged for 10 min
at 2000 rpm and the hexane layer removed. (3)
After repeating the procedure 3 times the combined fractions were concentrated using a
modified Synder column on a steam bath toa final
volume of 500 microliters. Adipose tissues were
extracted by a modified Mills procedure: (1) A
mixture consisting of the sample, soil, and anhydrous sodium sulfate was ground vigorously
into a uniform dry granular mass. (2) A nanograde

hexane-methoxyclor mixture was added and the resulting mixture transferred to a 150-ml beaker by washing 3 times with petroleum ether. (3) The mixture was filtered, evaporated to near dryness, cooled to room temperature, and reweighed for percent of fat content. (4) Two grams of this fat were transferred to a separatory funnel where partitioning, extractions with hexane, and subsequent column fractionation were carried according to previously described methods. Sera amd fat extracts were injected into a 2-column electron capture gas chromatograph. All quantitation was based on relative peak height. Each fifth fat extract sample and pooled sera were qualitatively analyzed by thin-layer chromatography. Seven organchiorine residue (p,p'-DDT, o,p'-DDT, p,p'-DDE, p, p'-DDD, dieldrin, beta-BHC, and heptachlor epoxide) were present in both fat and serum samples. a (Holoman-Battelle)

ORGANOCHLORINES IN THE SEASTAR ACANTHASTER PLANCI, Walla Walla Coll., College Place, Wash. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-06268

FORMALDEHYDE AS A POSSIBLE CAR-CINOGEN, Columbia Univ., New York. Dept. of Microbiolo For primary bibliographic entry see Field 05C. W73-06269

ORGANOCHLORINE PESTICIDES IN RAIN-WATER, OAHU, HAWAII, 1971-1972, Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.
For primary bibliographic entry see Field 05B.
W73-06270

GAS CHROMATOGRAPHIC DETERMINATION OF THE RATE CONSTANT FOR THE HYDROLYSIS OF HEFTACHLOR, Department of the Environment, Ottawa (Ontario). Water Quality Div. For primary bibliographic entry see Field 05B. W73-06271

POLYCHLORINATED BIPHENYLS: PHOTOLYSIS OF 3,4,3',4'-TETRACHLOROBIPHENYL AND 4,4'-DICHLOROBIPHENYL IN SOLU-TION. 110N, Michigan State Univ., East Lansing. Pesticide Research Center. For primary bibliographic entry see Field 05B. W73-06272

EFFECTS OF INSECTICIDES ON POPULA-TIONS OF RODENTS IN KANSAS - 1965-69, Kansas State Univ., Manhattan. Div. of Biology. R. J. Robel, C. D. Stalling, M. E. Westfahl, and A. M. Kadoum.

Pesticides Monitoring Journal, Vol 6, No 2, p 115121, September 1972. 1 fig, 8 tab, 22 ref.

Descriptors: "Chlorinated hydrocarbon pesticides, "Pesticide residues, "Phosphothioate pesticides, "Pollutant identification, "Chemical analysis, Small animals, Endrin, Aldrin, Diazinon, Separation techniques, Terrestrial habits, Methodology, Sampling, Organophosphorus pesticides, Hepacholor, "Kanasa, Organic pesticides, Paganic compounds, Gas chromatography, DDE, DDT, Solvent extractions, Insecticides, Pesticides. Identifiers: "Electron capture gas chromatography, "Animal tissues, Methyl parathion, Parathion, Sample preparation, Detection limits, Metabolites, Isomers, o p" DDT, p p" DDE, p p" DDT, Malathion, Sample preservation.

Group 5A—Identification of Pollutants

The effects were determined of recommended applications of commonly used insecticides (diazinon, endrin, heptachlor, parathion, methyl parathion, aldrin) on the population dynamics of unconfined rodent populations in Kanasa. The specimens were quick frozen the morning they were captured. Prior to analysis for insecticidal residues, each specimen was speartely thawed and homogenized, and a sample was extracted with hexane. An alargot was column sulfate, blended with high speed, filtered, and twice extracted with hexane. The hexane extract was concentrated under vacuum at 35-40°C and dibuted with hexane. An aliquot was used for cleanup and gas chromatographic analysis. The insecticides were separated and detected by electron capture gas chromatography using a 6-ft glass coluran, packed with 3 percent DC-11 on 60/80 meah silanized Gas Chrom P. The analytical procedure was capable of detecting residues of as low as 0.01 ppm of diazinon, parathion, methyl parathion, malathion, endrin, dieldrin, heptachlor, heptachlor epoxide, p,p-DDE, o,p-DDT, and p,p-DDT. During 19 separate 10-day trapping periods, 4,661 rodents were captured of which 162 were analyzed for the six insecticides. Insecticidal residues were detected in 36 of these specimens. Dieldrin residues were detected in 8 specimens (five of these specimens had residues of both dieldrin and heptachlor epoxide in 8 specimens exceeding 0.02 ppm, and no heptachlor epoxide levels exceeding 0.02 ppm, No residues of the other four insecticides were detected in any of the specimens. (Holoman-Battelle) W73-06274

MERCURY RESIDUES IN FISH FROM SASKATCHEWAN WATERS WITH AND WITHOUT KNOWN SOURCES OF POLLUTION

- 1970, Saskatchewan Univ., Saskatoon. Coll. of Home

Economics. A. K. Sumner, J. G. Saha, and Y. W. Lee. Pesticides Monitoring Journal, Vol 6, No 2, p 122-125, September 1972. 1 fig, 1 tab, 17 ref.

Descriptors: "Mercury, "Heavy metals, "Freshwater fish, "Chemical analysis, Canada, Water pollution, Separation techniques, Suckers, Pikes, Perches, Sampling, Methodology, Solvent extractions, Sauger, Walleye. Identifiers: "Muscle, "Atomic absorption spectrophotometry, "Saskatchewan River, Sample preparation, Detection limits, Chemical recovery, Goldeye, Sample preservation, Animal tissues, Chemical digestion.

In 1970, mercury concentrations were determined in muscle tissue of 125 fish from 10 Saskatchewan waters, 6 of which were part of the Saskatchewan River system receiving industrial and/or municipal wastes containing mercury and 4 of which had no River system receiving industrial and/or municipal wastes containing perecury and 4 of which had no known sources of mercury pollution. The total mercury content of each muscle tissue sample was determined by atomic absorption spectrometry according to the method of Saha, et al. A sample of fish tissue was digested under reflux with concentrated nitric and perchloric acids, the acidity adjusted to about 1N, and hydroxylamine hydrochloride was added. The solution was extracted twice with chloroform and the mercuric ions were extracted with a chloroform solution of dithizone and determined by AAS. About 93 to 98 percent of the mercury added to muscle tissue as HgC12 could be recovered by this method, and the manimum detectable amount was 0.005 ppm Hg. All fish specimens were analyzed in duplicate, and the mercury levels were not corrected for recovery. Concentrations in fish from the Saskatchewan River system ranged from 0.18 to 8.88 ppm depending on the degree of pollution of the fish collection site. Levels were higher (0.18 to 8.88 ppm depending on the degree of pollution of the fish collection site. Levels were higher (0.18 to 8.88 ppm in fish caught downstream from a chloralkali plant in Saskatoon than those (0.25 to 1.2 ppm) in fish from sites upstream from this plant whose sources of mercury were municipal or industrial wastes other than the chlor-alkali industry. Levels in fish from the four lakes without any known source of mercury pollution ranged from 0.11 to 1.13 ppm. These results indicate that mercury levels in fish from apparently unpolluted wasters may exceed the Canadian actionable level of 0.5 ppm of mercury; such residues may be of natural origin. (Holoman-Battielle) W73-06275

PESTICIDE RESIDUES IN SOIL FROM EIGHT PRITICIDE RESIDENCE IN ASSESSED AND PROPERTY OF THE PROPERTY O

Descriptors: "Pesticide residues, "Pollutant identification, "Chlorinated hydrocarbon pesticides, "Soil analysis, "Chemical analysis, Heavy metals, Separation techniques, Methodology, Sampling, Dieldrin, Endrin, Heptachlor, New Jersey, DDT, DDE, Solvent extractions, Connecticut, California, Texas, Kansas, Florida, Wisconsin, Utah, Organic pesticides, Halogenated pesticides, Gas chromatography organic compounderty, Chromatography. Identifiers: "Arsenic, "Atomic absorption spectrophotometry, Chromatography." Helectron capture gas chromatography, "Electron capture gas chromatography, "Electron capture gas chromatography, Metabolites, Isomers, Detection limits, Sample preparation, Chemical recovery, Heptachlor epoxide, Chlordane, op 'DDT, pp' DDT, op' TDE, p

RESIDUES IN FISH, WILDLIFE, AND ESTUA-RIES. MERCURY CONCENTRATIONS IN GAME BIRDS, STATE OF WASHINGTON - 1970 GAME BIRDS, STATE OF WASHINGTON - 1976 AND 1971. Hanford Environmental Health Foundation, Richland, Wash. F. E. Adley, and D. W. Brown. Pesticides Monitoring Journal, Vol 6, No 2, p 91-93, September 1972. 3 tab, 4 ref.

Descriptors: "Mercury, "Game birds, Chemical analysis, "Path of pollutants, Methodology, Common merganser duck, Geese (Wild), Common teal, Heavy metals, Food chains, Absorption, Food habits, Ducks (Wild), "Washington. Identifiers: "Liver, "Muscle," Flameless atomic absorption, Sample preparation, Atomic absorption spectrophotometry, Pheasant, Quail, Chukar partridge, Grouse, Animal tissues.

partridge, Grouse, Animal tissues.

In a survey to determine the presence of mercury in the liver of game birds, 246 specimens contributed by local hunters during Cotober, 1970 to January, 1971 and 4 obtained in May, 1971 were analyzed. The species included pheasant, quali, chukar partridge, duck, geese, and grouse. Muscle samples were submitted with some of the liver specimens and, in those instances, these tissues also were analyzed. Samples were dissolved in 1:1 sulfurio-nitric acids at about 60C, cooled, and a 6 percent why solution of KMn04 was added until a purple color persisted. An aliquot was taken from a final 100-ml volume and analyzed by flameless atomic absorption spectrophotometry. The highest average mercury concentrations were in livers from mergansers (11.67 ppm) and teal (0.29 ppm), species with diets including aquatic organisms and thus differing from the other samples. The average mercury levels in liver from the other species were mercury levels in liver from the other species were mercury levels in liver from the other species were mercury levels in liver from the other species were the summan of the species were the summan of the species with both muscle and liver tissue analyzed, quall had the highest muscle to liver ratios of mercury and mergansers, the lowest. (Holoman-Battelle)

EFFECTS OF ESTUARINE DREDGING OF TOXAFHENE-CONTAMINATED SEDIMENTS IN TERRY CREEK, BRUNSWICK, GA. - 1971, Georgia Univ., Sapelo Island. Marine Inst. For primary bibliographic entry see Field 05C. W73-06278

THE GC AND DIRECT INLETS MASS SPECTRA OF HEPTACHLOR AND 1-HYDRO-XYCHLORDENE,
Department of the Environment, Ottawa (Ontario). Water Quality Div.
A. Demayo, and M. Comba.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 4, p 212-216, October 1972.
3 fig, 4 ref.

Descriptors: "Heptachlor, "Gas chromatography, "Chlorinated hydrocarbon pesticides, Mass spectrometry, "Pollutant identification, Chemical reactions, Organic pesticides, Organic compounds, Halogenated pesticides. Hydroxychlordene, I-Ketochlordene, Diels-Alder reaction, Direct inlet spectrum, GC inlet spectrum, GC-MS interface.

Observations are reported of some of the interesting and important differences between the direct inlet and the GC inlet mass spectra of heptachlor and 1-hydroxychlordene. The major process which seems to occur in the mass spectrometer is a retro-Diels-Alder reaction leading to the formation of ions m/e 270 and 100 in the case of heptachlor, and ions m/e 270, 81, and 82 in the case of 1-hydroxychlordene. A second important reaction taking place upon electron impact is the loss of a chlorine atom from the original molecule, leading

to the formation of ions m/e 335 and 317 in the case of heptachlor and 1-hydroxychlordene, respectively. The molecular ion, M (plus), is present in the spectra of both compounds. The mass spectra obtained via the GC inlet differ quite drastically from the spectra of the same compounds obtained through the direct inlet system. The retro-Diels-Alder reaction seems to play an almost negligible role in the GC inlet spectrum of heptachlor and 1-hydroxychlordene is not converted to 1-ketochlordene in the GC column. It is suggested that heptachlor is formed from 1-hydroxychlordene under the conditions present in the batch inlet system. (Holoman-Battelle) W73-06279 to the formation of ions m/e 335 and 317 in the

DISCRIMINATION BETWEEN PCB AND DDT RESIDUES BY A GAS CHROMATOGRAPHIC-MASS SPECTROMETRIC TECHNIQUE, Harvard Univ., Cambridge, Mass. Dept. of

Bulletin of Environmental Contamination and Toxicology, Vol 8, No 4, p 208-211, October 1972.

Descriptors: *Gas chromatography, *Mass spectrometry, *Pollutant identification, *Pollychlorinated biphenyls, *DDT, *Separation techniques, Chemical analysis, Chlorinated hydrocarbon pesticides, Pesticide residues, DDE, Methodology.

Methodology. Identifiers: Environmental samples, Reproducibility, Detection limits, Chlorinated hydrocarbons, Mass spectra, Metabolites, Pentachlorobiphenyl, Aroclor 1254, Retention time, Hexachlorobiphenyl, pp' DDT, pp' DDE.

Aroctor 1234, Ketention time, Hexachlorobiphen-yl, p.p' DDT, p.p' DDE.

A gas chromatographic-mass spectrometric procedure has been used for the confirmation of gas chromatographic analyses of PCB's, p.p'-DDT, and p.p'-DDE in environmental samples. The mass spectrometric procedure for the analysis of the gas chromatographic fraction with the retention time of p.p'-DDE (which may also contain pentachlorobipheny) is as follows. The mass spectrometer is set to scanning repetitively over a mass range approximately 315 to 330. A collection tube from the gas chromatographic fractionation is introduced through the direct insertion probe. Care is taken to ensure that the end of the tube which the gas chromatographic effluent entered is closest to the mass spectrometer's ion source. If p.p'-DDE is present, peaks are observed at M/e equals 324, 326 and 328 of relative intensity 77:100-9. If pentachlorobiphenyl is present, peaks are observed at M/e equals 324, 326 and 328 of relative intensity 62:100-65. If both chemicals are present, both sets of peaks are observed. One nanogram of p.p'-DDE or pentachlorobiphenyl can reproducibly be detected from 5 ng of Aroctor 1234. A similar procedure is used to distinguish p.p'-DDT from hexachlorobiphenyl with scanning of the mass range 330-365. If p.p'-DDT is present, peaks are observed at M/e equals 335, 360, 362 and 364 of relative intensity 62:100-65. If hexachlorobiphenyl is present, peaks are observed at M/e equals 335, 360, 362 and 364 of relative intensity 62:100-65. If hexachlorobiphenyl is present, peaks are observed at M/e equals 353, 360, 362 and 364 of relative intensity 62:100-65. If hexachlorobiphenyl can be detected from 5 ng of Aroctor 1254. (Holoman-Battelle)

W73-06280

POLYMORPHISM IN THE DESMID MICRASTERIAS LATICEPS AND ITS TAX-ONOMICAL IMPLICATIONS, Instituto de Botanica, Sao Paulo (Brazil). Phycology Section.
For primary bibliographic entry see Field 05C.
W73-06287

THE BIOCHEMICAL ANALYSIS OF SOME ESTUARINE PHYTOPLANKTON SPECIES. I. FATTY ACID COMPOSITION, Oregon State Univ., Corvallis. Dept. of Botany and Plant Pathology.
C. L. DeMort, R. Lowry, I. Tinsley, and H. K.

Painney.

Journal of Phycology, Vol 8, No 3, p 211-216, September 1972. 5 tab. 29 ref.

Descriptors: "Phytoplankton, "Estuarine environment, Chlorophyta, Chrysophyta, Marine algae, Cultures, Gas chromatography, Organic acids, Diatoms, Chlorella, Chlamydomonas, Chemical analysis, Biochemistry, "Oregon, Chromatography, Algae, Analytical techniques.

Identifiers: "Fatty acids, "Biochemical analysis, Chemical composition, Gas liquid chromatography, Thin layer chromatography, "Yaquina Bay, Sample preparation, Cryptophyta, Cylindropyxis, Methyl esters, Culture media, Tetraselmis sueccica, Chlorella protophila, Chlamydomonas palla, Cryptomonas salina, Prymnesium parvum, Isochrysis galbana, Cylindrotheca gracilis, Navicula abscondita, Navicula biskanteri.

The fatty acid composition of 10 species of estuarine phytoplankton was determined using gas-liquid chromatography. Nine of the species were isolated from Yaquina Bay, Oregon. These species were common components of the phytoplankton of the bay. The tenth species, localrysis galbana, was obtained from the Culture Collection of Algae at Indiana University. The 10 organisms comprised 3 species of Chlorophyta, 1 species of Cryptophyta, and 6 species of Chrysophyta. Twenty-eight fatty acids were found in the 10 species. The fatty acids common to all species were 14-0, 16-0, 16-1, 18-0, 18-1, and 18-2. The Chlorophyta were distinguished by a high content of linolenic acid, 18-3. The diatoms were distinguished by a high proportion of 10:5. All species contained a high proportion of palmitic acid, 16-0. (Holoman-Battelle)
W73-06289

SIMPLIFIED COULSON ELECTROLYTIC CONDUCTIVITY DETECTOR FOR CHLORINATED HYDROCARBONS, Cornell Univ., Ithaca, N.Y. Pesticide Residue

Lab.
Lab. Lab. A. Bache.
L. E. St. John, Jr., and C. A. Bache.
Journal of the Association of Official Analytical
Chemists, Vol 55, No 5, p 1152-1153, September
1972. 2 fig, 7 ref.

Descriptors: *Gas chromatography, Organic compounds, Chemical analysis, Fish, Plant tissues, Dieldrin, Heptachlor, Affalfa.

Identifiers: *Electrolytic conductivity detector, *Calorinated hydrocarbons, Biological materials, Chemical recovery.

A simple plug of Gas-Chrom Q as a gas flow restrictor inserted in the combustion tube of the electrolytic conductivity detector eliminates the meed for expensive valving when the detector is used in the chlorine mode without a platinum catalyst. The combustion tube required cleaning with 10 percent hydrofluoric acid every two weeks when the detector was used in the analysis of check alfalfa and alfalfa for the recovery of dieldrin and heptachlor. The detector is currently being used to monitor chlorinated hydrocarbons in fish and paper. (Holoman-Battelle)

AG CLORDANE: DEVELOPMENT OF METHODS FOR ITS ANALYSIS AND CON-

TROL, Velsicol Chemical Corp., Chicago, Ill.
M Malina, A. Rozek, and B. Schwemmer.
Journal of the Association of Official Analytical
Chemists, Vol. 55, No. 5, p 942-947, September
1972. 5 fig. 5 tab.

Descriptors: *Chlorinated hydrocarbon pesticides, Heptachlor, Gas chromatography. Identifiers: *AG chlordane, Precision, *Infrared spectrophotometry. Sample preparation, *Gas liquid chromatography, Chlordane, Infrared spec-tra, Chromatograms.

AG chlordane is a high purity compound containing 95 percent alpha- and gamma-chlordane. Five methods have been developed for analyzing AG chlordane and its formulations. Two methods involve infrared procedures: assay of AG chlordane in granular formulations and alpha- and gamma-chlordane in AG chlordane. The other 3 methods used gas chromatography as the determinative step: assay of heptachlor and nonachlor in AG chlordane and AG chlordane as emulsifiable concentrates. The precisions obtained for all 5 methods are good. (Little-Battelle)

NONAQUEOUS COPPER COLORIMETRIC METHOD FOR DETERMINATION OF MALATHION IN TECHNICAL GRADE MALATHION AND IN MALATHION FORMU-

erican Cyanamid Co., Princeton, N.J. Agricul-R. S. Wayne, W. C. Groth, J. W. Miles, and G. O.

Ournal of the Association of Official Analytical Chemists, Vol. 55, No. 5, p 926-938, September 1972. 9 fig, 12 tab, 10 ref.

Descriptors: *Colorimetry, Spectrophotometry Organophosphorus pesticides, Statistical method Identifiers: *Chemical interference, *Samp preparation, *Precision, *Malathion, Coppo colorimetry, Method validation.

A nonaqueous copper colorimetric procedure has been developed for the assay of technical and formulated products of malathion. The stability of the copper 0,0-dimethyl phosphorodithioate complex has been substantially improved by the use of non-polar solvents and by lowering the hydrogen ion activity of the system. This has permitted the elimination of the partitioning step and has relaxed the critical timing requirements specified in the official first action AOAC method. The new method has a precision of plus or minus 1.6 percent at a 95 percent confidence level. The accuracy of the technique is discussed in terms of various minor interferences and by contrasting the results obtained with alternative assay methods. (Little-Battelle) telle) W73-06292

SIMULTANEOUS POLAROGRAPHIC DETER-MINATION OF MICRC. AMOUNTS OF COBALT (II), ZINC AND NICKEL IN THE ANALYSIS OF SOILS, (IN RUSSIAN), Gomel State Univ. (USSR). V. B. Sleakovsky, S. K. Lapitskaya, and V. G. Sviridenko. Zhurnal Analiticheskoi Khimii, Vol. 27, No. 3, p 602-604, March 1972. 2 fig. 2 tab, 9 ref.

Descriptors: *Polarographic analysis, *Cobalt, *Zinc, *Nickel, *Soil analysis, *Pollutant identification, Heavy metals, Chemical analysis. Identifiers: *AC polarography, Trace levels.

It is possible to determine cobalt (II), zinc and nickel in the presence of ammonia-ammonium solution with good resolving power by means of the method of alternating current polarography. A method has been worked out for simultaneous determination of moving forms of cobalt (II), zinc and nickel in soils. (Holoman-Battelle) W73-06296

PHOTOCHEMISTRY OF BIOACTIVE COM-POUNDS. PHOTOLYSIS OF M- (N,N---DIMETHYLFORMAMIDINE) PHENYL N-

Group 5A-Identification of Pollutants

METHYLCARBAMATE HYDROCHLORIDE IN

WATER, Michigan State Univ., East Lansing. Pesticide Research Center. For primary bibliographic entry see Field 05B. W73-06298

VOLATILITY OF DDT AND RELATED COM-

POUNDS,
Agricultural Research Service, Riverside, Calif.
Soil and Water Conservation Research Div.
W. F. Spencer, and M. M. Cliath.
Journal of Agricultural and Food Chemistry, Vol.
20, No. 3, p 645-649, May-June 1972. 3 fig, 5 tab,

Descriptors: *DDT, *Volatility, *Chlorinated hydrocarbon pesticides, *Sands, *Pesticide drift, *Pesticide kinetics, Chemical analysis, Vapor pressure, Dieldrin, Density, DDE, Temperature, DDD, Nitrogen, Soils, Silica, Pollutant identification, Loam, Silts.

Identifiers: *Gas saturation method, Isomers, Gas liquid chromatography, Metabolites, p p' DDT, o p' DDE, p p' DDE, Vapor pressure, p p' DDD, o p' DDD, Description, HEOD.

Vapor pressure and relative volatility of DDT and related compounds are determined and their behavior when applied to soil is described. Vapor pressures of two isomers of DDT and some of their degradation products, measured by a gas saturation method, indicate that o,p'isomers are more volatile than the p,p'isomers. The vapor pressure of o,p'-DDT is 7.5 times that of p,p'-DDT. At 30 C the atmosphere above a surface deposit of technical grade DDT contains approximately 62 percent o,p'-DDT, el percent p,p'-DDE, 14 percent p,p'-DDE, and only 8 percent p,p'-DDT. When technical grade DDT is applied to moist soil at concentrations up to 20 micrograms/g, the atmosphere in and above the soil contains approximately equal quantities of o,p'-DDT and p,p'-DDT, but at higher concentrations the ratio of o,p'- to p,p'-DDT in the vapor phase increases. Dieldrin applied with DDT did not affect DDT vapor density and the interaction between o,p'- and p,p'-DDT was very slight. Air drying of soil reduced volatility of all compounds. The primary breakdown product of DDT, p,p'-DDE, has a higher vapor pressure than the original compound, p,p'-DDT, which indicates that much of the DDT now present in the soil may volatilize as DDE. (Byrd-Battelle) Vapor pressure and relative volatility of DDT and

DETERMINATION NITROSODIMETHYLAMINE IN THE LOW PARTS PER BILLION, Uniroyal Inc., Naugatuck, Conn. Uniroyal Chemi-

J. E. Newell, and H. R. Sisken. Journal of Agricultural and Food Chemistry, Vol. 20, No. 3, p 711-713, May-June 1972. 4 fig, 1 tab, 8

Descriptors: *Chemical analysis, *Aqueous solu-tions, *Apples, *Milk, *Pollutant identification, Distillation, Gas chromatography, Nitrogen, Nitrogen compounds, Organic compounds, Plant

listues.

*Nitrosodimethylamine, Vacuum distillation, Microcoulometry, Chemical recovery, Sensitivity, Sample preparation.

Nitrosodimethylamine (NDMA) was measured in Nitrosodimethylamine (NDMA) was measured in raw and cooked apples and milk in the low ppb range of vacuum distillation, concentration, gas chromatography, and microculometric nitrogen determination. The concentration of the NDMA was achieved by percolation of the aqueous distillate through polymer beads. The method is sensitive to 3 ppb and the recovery was 70 percent or better. (Byrd-Battelle) W73-06300

ANOXIC WATER IN THE PETTAQUAMSCUTT RIVER, Rhode Island Univ., Kingston. Graduate School of

Oceanography.
For primary bibliographic entry see Field 05B.
W73-06303

A MONITOR FOR 22 WATER POLLUTANTS.

Environmental Science and Technology, Vol. 6, No. 6, p 510, June 1972.

Descriptors: *Water pollution control, *Monitoring, *Pollutant identification, *Equipment, *Instrumentation, Water temperature, Conductivity, Chlorides, Copper, Turbidity, Dissolved oxygen, Sodium, Hydrogen ion concentration, Physiochemical properties, Alkali metals, Heavy metals, Chromium, Cadmium, Automatic control. Identifiers: Enviro Monitor, Alum.

The new battery-powered Enviro Monitor of Enviro Control (Washington, D.C.) has the capability for monitoring up to 22 water pollutants. This all-weather monitor has three primary functions: (1) to record and control processing streams from treatment processes on location; (2) to give a sound or light alarm when a particular parameter exceeds a preset value; and (3) to provide a permanent record of all parameters monitored. Some of the parameters that have been checked are conductivity, pH, temperature, chloride, copper, turbidity, oxygen (dissolved oxygen), alum, and sodium. The Enviro Monitor features sensor location independent of the monitor, a wide range of operating temperatures (-20 to 130 F) and a modular design for matching any industrial application. (Byrd-Battelle)

INFRARED STUDY OF METHYLENE GROUP ABSORPTIVITIES IN POLAR STRIGHT CHAIN ALIPHATIC COMPOUNDS, South Africa Coal, Oil and Gas Corp., Sasolburg.

Analytical Chemistry, Vol. 44, No. 7, p 1235-1239, June 1972. 7 fig, 1 tab, 8 ref.

Descriptors: *Spectrophotometry, Chemical analysis, Polarity, Carbon, Pollutant identification, Organic compounds. Identifiers: *Aliphatic hydrocarbons, *Absorptivities, *Methylene, *Infrared absorbances, Functional groups, Compensation method, n-Alcohols, n-Aldehydes, n-Carboxylic acids, n-Alkanes, Methyl.

The compensation method has been introduced to study the influence of polar groups on the methylene group absorptivities in homologous series of n-alcohols, n-aldehydes, and n-carboxylic acids as compared to n-alkanes. All recordings for the species of interest were obtained with a Perin-Elmer Model 221 Spectrophotometer. This new experimental method corrected for the mutual conference of carbot and activation and carbot and kin-Elmer Model 221 Spectrophotometer. This new experimental method corrected for the mutual overlap of methyl and methylene bands in the asymetrical C-H stretching region, enabling accurate measurements of methyl and methylene peak intensities. The absorption bands were actually recorded individually using cyclohexane and hexamethyldisilazane as compensating agents. Values for the methylene group absorptivities in homologous series of n-alkanes, n-alchohols, n-aldehydes, and n-carboxylic acids, were obtained without lengthy procedures by simply using the ratio of methylene/methyl peak absorbances. A function relating the experimental data was derived and discussed. It was shown that the methylene group absorptivity decreases with increasing polarity of the functional group and that the influence of a polar group was still evident twenty methylene groups away from the functional group. (Byrd-Battelle) SOLVENT EXTRACTION OF URANIUM (VI) WITH TRIOCTYLPHOSPHINE OXIDE IN THE PRESENCE OF AROMATIC CARBOXLIC

PRESENCE OF AROMATIC CARBOXLIC ACIDS, Bulgarian Academy of Sciences, Sofia. Inst. of General and Inorganic Chemistry. St. Mareva, N. Jordanov, and M. Konstantinova. Analytica Chimica Acta, Vol. 59, No. 2, p 319-323,

April 1972. 4 fig, 2 tab, 7 ref.

Descriptors: *Solvent extractions, *Aromatic compounds, *Organic acids, *Aqueous solutions, *Heavy metals, Gravimetric analysis, Iron, Chemical analysis, Hydrogen ion concentration, Cations, Pollutant identification, Photometry, Centrifugation. Identificars: *Trioctylphosphine oxide, *Uranium, Organic solvents, Thorium, Sample preparation, Chemical concentration, Distribution coefficients, Chemical interference, Rare earth elements, Phenylpropiolic acid, o-Chlorobenzoic acid, Salicylic acid, Benzoic acid, trans-Cinnamic acid, Hydroxycinnamic acid, o-Nitrobenzoic acid, Zirconium, Cerium, Gadolinium, Yttrium, Lanthanum.

Cerium, Gadolinium, Yttrium, Lanthanium.

The procedure for the solvent extraction of uranium with trioctylphosphine oxide (TOPO) in the presence of monoaromatic carboxylic acids is described. For exch test 1000 micrograms of uranium in aqueous solution at the appropriate pH was extracted with an organic acid solution which contained a mixtrue 0.04 M TOPO and a monoaromatic carboxylic acid. The pH and organic acid used varied with experiment. Examination of extraction curves showed a region of antagonistic action (pH 1-1.80) and region of synergic action (pH greater than 1.8). The antagonistic effect resulted from the high acidity while the synergic effect resulted from a linear relationship between pK values of the organic acids. However, salicylic acid showed an exceptionally high synergic effect. EDTA was shown to mask interfering elements of this uranium extraction technique. Interfering elements such as rare earth elements, thorium, zirconium, and iron were also separated by a mixture of TOPO and salicylic acid at pH 5. (Long-Battelle) W73-06307

EFFECT OF GAMMA RADIATION ON COLORIMETRIC DETERMINATION OF IRON, Oak Ridge National Lab., Tenn H. E. Zittel.

Analytica Chimica Acta, Vol. 58, No. 2, p 323-329, February 1972. 3 fig, 8 ref.

Descriptors: *Iron, *Colorimetry, *Radioactivity techniques, *Heavy metals, Gamma rays, Radiochemical analysis, Trace elements, Pollutant identification, Irradiation, Color reactions, Chemical reactions.

Identifiers: *Reagents, Alpha-alpha prime-bipyridyl, 1 10-phenathroline, Thiocyanates, Sensitivity, Sample preparation, Absorbance, Radiation chemistry.

The effects of relatively high levels of gammaradiation on colorimetric determination of iron by
three reagents thiocyanate, 1,10-phenanthroline,
and alpha, alpha prime-bipyridyl are described. Irradiation of the samples at 60,000 rad per hour is
carried out with a 300-curie Cobalt-60 source.
Spectral curves as well as absorbance measurements are obtained by spectrophotometry. The
thiocyanate reagent is found to be sensitive to
gamma-radiation because the Fe (II) formed from
Fe (III) and thiocyanic acid can be radiolytically
reoxidized. In order to avoid error, the thiocyanate
and 1,10-phenanthroline methods required taking
blanks through the entire procedure under radiation conditions similar to the sample. The 1,10phenanthroline method was found to be useful at
higher radiation levels (ca. 100,000 rad). The alpha,
alpha prime-bipyridyl method is sensitive at radiation levels below 100,000 rads, and resultant errors
at higher levels are due to complexing problems

between iron and the reagent. The nature of the experimental error in the latter test prevented correction by blank standardization. (Long-Battelle) W73-06308

SOURCE-TIME RESOLVED. PHOSPHORIMETRY, Florida Univ., Gainesville. Dept. of Chemistry. R. P. Fisher, and J. D. Winefordner.

Analytical Chemistry, Vol. 44, No. 6, p 948-956, May 1972. 12 fig, 4 tab, 12 ref.

Descriptors: *Chemical analysis, *Organic compounds, Methodology, *Instrumentation, Selectivity, Pollutant identification.

Identifiers: *Time resolved phosphorimetry, Mixtures, Pulsed source phosphorimetry, Mix-*Phosphorescence, Antrone, Benzaldehyde, Benzophenone, 4-Bromoacetophenone, Sensitivi-ty, Precision.

A pulsed source phosphorimeter for time resolu-tion phosphorimetry is described. The principles of time resolution phosphorimetry are discussed, and basic expressions relating the measured phosphorescence signal to concentration of each analyte (phosphor) in a multicomponent organic mixture of spectrally similar organic molecules are given. Three specific methods are described and used for estimating concentrations from phosphorescence signals measured at different times after the termination of excitation for several complex binary and a single complex ter-nary mixture of spectrally similar organic phosphors. The instrumental details of the pulsed source phosphorimeter are described in detail. The pulsed source phosphorimeter has a number of advantages compared to the conventional continuously operated source-rotating can phosphoroscope phosphorimeters including in-creased sensitivity and selectivity and applicability to fast decaying (millisecond decay times) phosphors. (Byrd-Battelle)

DETERMINATION OF PHOSCHLOR, DICHLORVOS (DDVP), AND MALATHION IN WATER BY THIN LAYER CHROMATOGRAPHY, (IN POLISH), D. Zycinski.

Rocz Panstw Zakl Hig. Vol 22, No 2, p 189-194.

NOCZ Pansaw Zari rig. vol 22, No 2, p 163-154.

1971. Illus. English summary.

Identifiers: "Chromatography (Thin layers),

"Dichlorvos (DDVP), "Malathion, "Phoschlor,
Water analysis, Pollutant identification.

A method was elaborated for the determination of phoschlor, dichlorvos (DDVP) and malathion in water by thin layer chromatography. The pestiwater by thin layer chromatography. The pesti-cides were extracted from the sample with chloroform. The chromatographic procedure was carried out in silica gel G of Merck as the adsor-bent, the solvent system chloroform-acetone (9:1) being used for the development. The spots of phoschlor and dichlorvos were located with silver nitrate, butter yellow, and UV light. Malathion spots were detected with fluorescein and bromine vapors. The smallest detectable amount determined under the reported procedure amounted to 0.01 mg/liter for phoschlor and dichlorvos, and 0.02 mg/liter for malathion.—Copyright 1972, Biological Abstracts, Inc.

ECOLOGICAL STUDIES IN THE PLANKTON OF CERTAIN FRESHWATER PONDS OF HYDERABAD-INDIA. II. PHYTOPLANKTON-2, Osmania Univ., Hyderabad (India). Hydrobiology Lab. For primary bibliographic entry see Field 05C.

AN EVALUATION OF CERTAIN INDICES OF EUTROPHY AND MATURITY IN LAKES, Miami Univ., Oxford, Ohio. Dept. of Zoology. For primary bibliographic entry see Field 05C.

A MODIFIED SEDIMENTATION SYSTEM FOR COUNTING ALGAE WITH AN INVERTED MICROSCOPE, Royal Holloway Co., Englefield Green (England).

Dept. of Botany. J. H. Evans. Hydrobiologia, Vol 40, No 2, p 247-250, 1972. 1 fig, 4 ref.

Descriptors: *Analytical techniques, *Algae, *Methodology, Diatoms, Chlorophyll, Weight, Or-

Spanic matter.

Identifiers: *R.H.C. split-tube technique, Sample sedimentation, Quantative determination.

Quantitative determination of small algae by sedi-mentation of samples to which have been added Lugol's iodine followed by observation with an in-verted microscope is well known and described verted microscope is well known and coescineer and modifications of the standard technique have been used for about twelve years. Despite modification advantages, few laboratories have adopted it, making desirable a full description of the standard methods. Volume usually used is I ml but 0.5 or 2 ml sub-samples may also be used. Sedimenta-tion time is about one hour for each ml. Then the supernatant liquid is pipetted out without disturb-ing the sedimented part. The sedimentation tube is then slid completely off and the sedimentation then and completely off and the seumentation mounted on the stage of an inverted microscope for algal determination and counting. The main ad-vantage of this technique is optical. The sub-stage condenser can be lowered sufficiently close for critical illumination even with a 1/12th oil immersion lens. Such details as flagella, chrysophyceaen spines, shape and chromatophore number, and diatom cell wall sculpturing can be clearly seen. This method has been used with other methods of quantitative alga determinations including chlorophyll-a extraction, dry weight and organic matter analyses, haemocytometer and membrane-filter counts and the Coulter Counter. (Jones-Wisconsin) W73-06347

THE JIMSONDE - A HIGH RESOLUTION TEM-

PERATURE SENSOR, National Aeronautics and Space Administration, Huntsville, Ala. George C. Marshall Space Flight For primary bibliographic entry see Field 07B. W73-06371

PALLMANN METHOD FOR MASS SAMPLING OF SOIL, WATER, OR AIR TEMPERATURES, Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics.
For primary bibliographic entry see Field 07B.
W73-06374

CHARACTERIZATION OF GELBSTOFFE IN MONTEREZ BAY BY VIV.ON ADSORPTION, UV, AND PAPER CHROMATOGRAPHY, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 05B. W73-06388

WATERWAYS FOR HARDNESS AND ACIDITY, West Virginia Univ., Morgantown. Dept. of Animal Industry and Veterinary Science. For primary bibliographic entry see Field 02K. W73-06397 CHEMICAL ANALYSIS OF MARION COUNTY

EXTRACTION AND CONCENTRATION OF OR-GANIC SOLUTES FROM WATER, Geological Survey, Denver, Colo. Water Resources Div. For primary bibliographic entry see Field 07B. W73-05409

REPORT TO THE SANITARY WATER BOARD ON POLLUTION OF SLIPPERY ROCK CREEK, POLUME II.

Pennaylvania Dept. of Health, Harrisburg. Div of Sanitary Engineering.

For primary bibliographic entry see Field 05G.

W73-06458

5B. Sources of Pollution

MERCURY IN BRYOPHYTES (MOSS), JBF Scientific Corp., Burlington, Mass. D. S. Yeaple. Nature, Vol. 235, No 5335, p 229-230, January 28, 1972. 1 tab, 6 ref.

Descriptors: *Mercury, *Mosses, *Northeast U.S., Air pollution, Analytical techniques, Soils, Cities, Rural areas, Distribution patterns.

In a determination of the potential of mosses for use as indicator organisms of mercury pollution, samples of moss from various populous and sparsely populated areas of Northeastern United States were tested. The mosses were wet ashed with nitric and sulfuric acids and potassium persulfate, and total mercury was determined using flameless atomic absorption spectrophotometry. Levels ranged from 250 to 1,450 ppb in the Boston area with Walden, N.Y. having a sample with 2,000 ppb. Two mountain and two coastal samples had low concentrations of mercury. There is a definite trend toward lower levels in less densely populated areas, however rural areas close to the populated areas, however rural areas close to the Boston metropolitan center generally show higher levels than do coastal areas in Maine with similar population density. A number of suggestions for further research are given. (Eagle-Vanderbilt) W73-05831

MERCURY IN MARINE ORGANISMS OF THE

TAY REGION, Dundee Univ. (Scotland). Dept. of Biological

A. M. Jones, Y. Jones, and W. D. P. Stewart. Nature, Vol 238, No 5360, p 164-165, July 21, 1972. 3 tab, 12 ref.

Descriptors: "Mercury, "Algae, "Molluaks, "Estuarine environment, Analytical techniques, Sampling, Aquatic life, Marine algae, Heavy metals. Identifiers: *Tay Estuary (U.K.), Atomic absorp-

tion spectroscopy.

Data on mercury concentrations in some organisms collected from the Tay region are presented. Concentrations vary according to the sampling area examined and are highest in organisms receiving direct discharge from the Tay. High levels of mercury were found in algae collected from a site subject to discharge of freshwater from the River Tay while no mercury was detectable in algae from a fully marine environment. Molluscs of three different feeding types (suspension feeders, herbivores, and carnivores) had high levels of mercury, indicating that mercury is present at appreciable concentrations at several trophic levels. Rapid variations of mercury concentration with time occurred in algae and molluscs with the maximum concentrations occurring 4 days later in molluscs than in the algae. High levels of mercury were present and concentrated in the liver and kidney of a grey seal and an eider duck tested. (Eagle-Vanderbilt) W73-05852

Group 5B-Sources of Pollution

DISTRIBUTION OF HEAVY METALS IN THE VICINITY OF AN INDUSTRIAL COMPLEX, Bristol Univ., (England). Dept. of Inorganic Chemistry.

A. Burkitt, P. Lester, and G. Nickless.
Nature, Vol 238, No 5363, p 327-328, August 11, 1972. 1 fig., 4 tab., 3 ref.

Descriptors: "Heavy metals, "Air pollution, "Industrial plants, "Vegetation, Industries, Soils, Grasses, Cadmium, Lead, Zinc, Winds, Analytical techniques, Laboratory tests.
Identifiers: "Airborne pollution.

Identifiers: *Airborne pollution.

Abnormal concentrations of lead, cadmium and zinc exist in the headwaters, sediments and living organisms of the Bristol Channel. To determine whether or not there is airborne pollution in the same area, samples of grass, moss, lichen and soil were collected from pasture and from the crests of lew hills. Samples were taken NE from a smelting works, where the prevailing wind is from the W-Sw. Samples were taken NE from a smelting works, where the prevailing wind is from the W-Sw. Samples were dried, digested, and tested by atomic absorption spectroscopy. High concentrations of zinc, cadmium, and lead are found near the smelting works along the path of the wind with aignificant quantities as far away as 7 miles. Away from the line of the prevailing wind, relatively low concentrations were found even at sampling points very close to the urban complex. It is concluded that lead, cadmium, and zinc impurities are carried by air from the industries in this area. (Eagle-Vanderbilt)

W73-03855

GROWTH OF CHLAMYDOMONAS IN A MEDI-UM CONTAINING MERCURY, Hebrew Univ., Jerusalem (Israel). Dept. of Medical Ecology.
For primary bibliographic entry see Field 05C.
W73-05856

POPULATION DIFFERENTIATION IN MARCHANTIA POLYMORPHA L. IN VARIOUS LEAD POLLUTION LEVELS, Glasgow Univ. (Scotland). Dept. of Botany.

D. Briggs. Nature, Vol 238, No 5360, p 166-167, July 21, 1972. 2 tab, 7 ref.

Descriptors: *Lead, *Vegetation, *Resistance, Laboratory tests, Soils, Air pollution, Growth rates, Genetics, Industrial wastes, Metals, Bioin-dicators, Cities, Rural areas. Identifiers: Liverworts, Scotland, *atmoci absorption spectroscopy.

Eleven samples of liverwort and the soil beneath them were collected north-west from central Clasgow to a point 13 km from the city. Lead content of the samples was determined by digestion and measurement by atomic absorption spectrophotometry. Samples taken at different distances from the city suggest that there is considerable lead pollution in the west end of the city and near main roads, but lower levels were found 10-13 km NW of the city, especially away from roadways. There is usually a higher concentration of lead in the liverwort than in the soil. High levels of lead in Marchantis thalli are usually associated with high soil levels. Undisturbed soil sometimes has a high lead content. To see if plants are differentially sensitive to lead, a single clone from each of four populations was studied. The clone from a plant with a low lead content grew significantly less well on lead agar than on a control medium. Clones from city plants grew equally well on lead agar and on control medium. There is a genetic difference in lead tolerance in Marchantia. This liverwort has promise of being a valuable indicator species. (Eagle-Vanderbilt)

THE TOXICITIES OF MERCURY AND ITS COMPOUNDS, Nebraska Univ., Omaha, Coll of Medicine.

For primary bibliographic entry see Field 05C. W73-05858

MERCURY: ANATOMY OF A POLLUTION PROBLEM, L. Dunlap. Chemical and Engineering News, Vol 49, No 27, p

Chemical and Engineering News, Vol 49, No 27, p 22-34, July 5, 1971. 16 fig. 1 tab.

Descriptors: "Mercury, "Environmental effects,
"Chemical reactions, "Path of pollutants, Heavy
metals, Metals, Metal organic pesticides, Toxicity,
Trace elements, Air pollution, Water pollution,
Standards, Pollutant identification, Toxins,
Laboratory equipment, Sampling, Testing, Human
diseases, Industrial wastes, Legislation.
Identifiers: "Mercury pollution, "Methylation,
"Organomercurials, Poisoning."

*Organomercurials, Poisoning.

The mercury pollution problem - its extent and its portable impact is discussed. The pathways of mercury methylation are followed by the exploration of the failure of our environmental 'early warning system'. By the end of 1970 elevated mercury levels were found in the waterways of 33 states. Even though an increase of mercury levels due to industrial discharges is evident, man's effect on environmental mercury concentrations is still debatable. Several possible schemes or routes for biochemical methylation of mercury are presented: Cobalamin-dependent N (5)-methyl-tetrahydrofolate- homocysteine transmethylase (methionine synthetase) - induced by a number of organisms including certain E. coli mutants; acctate synthetase, induced by certain anaerobes; and methane synthetase, common in anaerobes; and methane synthetase for the biggest industrial transformations. A profile of the biggest industrial transformations in the state of the biggest industrial transformations in the state of the biggest industrial transformations in the state of the biggest industrial transformation in the state of the biggest indust Vanderbilt)

STUDIES ON HUMAN EXPOSED TO METHYL MERCURY THROUGH FISH CONSUMPTION, Kungliga Karolinska Mediko-Kirurgiska Institu-tet, Stockholm (Sweden). King Gustaf V Research

For primary bibliographic entry see Field 05C. W73-05860

FACTORS INFLUENCING THE IN VITRO UP-FACTORS INFLUENCING THE IN VITRO UP-TAKE OF MERCURY VAPOUR IN BLOOD, Aarhus Univ., (Denmark). Inst. of Pharmacology. F. N. Kudsk. Acta Pharmacologica et Toxicologica, Vol 27, p 161-172, 1969. 4 fig, 3 tab, 24 ref.

Descriptors: *Mercury, *Human pathology, *Rates of application, Toxins, Heavy metals, Chemical reactions, Path of pollutants, Laboratory tests, Human diseases, Analytical techniques. Identifiers: *Mercury uptake, *Blood, Glutathione, Uptake rate, Clinical studies.

A number of factors have been investigated in order to clarify the mechanism by which mercury is oxidized in blood. The rate of mercury uptake in blood in a pure oxygen atmosphere is moderately increased, but somewhat decreased in a nitrogen atmosphere when compared with the rate of uptake in an atmospheric air phase. Increasing concentrations of methylene blue from 1/256 x ten to the 4 power to 1/8 x 10 to the 4 power M induce a very pronounced acceleration of the rate of mercury uptake in blood up to a maximum of about 10 times the normal uptake in an atmospheric air phase. Menadione shows a similar, but even more pronounced effect in concentrations of potassium cyanide from 0.0001 + 0.004 M cause a progressive inhibition of the mercury uptake in blood up to a maximum of about 60%, which is very similar to the effect produced by ethyl alcohol. The in-

vestigations point to hydrogen peroxide and ox-idized glutathione as agents of importance in the oxidation and uptake of mercury vapor in blood. The way in which ethyl alcohol inhibits the uptake is still unknown. Some possible mechanisms are discussed. (Obszkiewicz-Vanderbilt) W73-03867

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AN EXPERIMENT ON THE EFFECT OF POND SOIL ON CALCIUM IN POND WATER, Alabama Agricultural Experiment Station, Au-

burn. G. N. Greene. Transactions of the American Fisheries Society, Vol 100, No 3, p 580-583, 1971. 1 fig, 2 tab, 2 ref. Rockefeller 65061.

Descriptors: "Calcium, "Ponds, "Hardness (Water), "Soil chemical properties, Soil tests, Aquatic habitats, Limology, Model studies, Sampling, Water analysis, Chemical reactions, Earth water interfaces, Mud-water interfaces, Fish reproduction, Metals.

Plastic lined pools with and without soil and calci-um were fertilized monthly with super phosphate and ammonium nitrate, and samples of water were taken five times over a 5 month period. In pools without soil the calcium level rose, due to addition of the fertilizer while in pools with soil, the calci-um level dropped during the test period. This in-dicates that liming soft water ponds will not suffi-ciently increase the water hardness until the lime requirement of the soil of the pond bed is satisfied. After that point, the calcium level in the water equilibrates at about 40 ppm. (Jerome-Vanderbilt) W73-05870

DISTRIBUTION AND CONCENTRATION MERCURY IN AUTOPSY SPECIMENS HUMAN BRAIN, State Univ. of New York, Buffalo, Dept. of Anatomy.
For primary bibliographic entry see Field 05A.
W73-05877

DISTRIBUTION OF MERCURY IN EAST PACIFIC SEDIMENTS, Miami Univ., Fla. Inst. of Marine and Atmospher-For primary bibliographic entry see Field 05A. W73-05880

DISTRIBUTION OF MERCURY IN THE SEDI-MENTS OF NEW HAVEN (CONN.) HARBOR, Yale Univ., New Haven, Conn. Dept. of Geology and Geophysics.
M. D. Applequist, A. Katz, and K. K. Turekian.
Environmental Science and Technology, Vol 6,
No 13, p 1123-1124, December 1972. 1 fig, 1 tab, 5

Descriptors: *Mercury, *Heavy metals, *Sediments, Sludge, Sampling, *Connecticut, Chemical reactions, Trace elements, Cores, Toxicity, Path of pollutants, Teating, Water pollution, Municipal Identifiers: *Mercury pollution, *New Haven

Distribution of mercury in sediments of New Haven Harbor indicates that the primary supply is from municipal sewer outfalls in the harbor. It is suspected that heavy metals seages the plant with escaping sewage sludges, which settle into the sediment. Samples were collected from boats using core samplers. The concentrations found in the top layer (0-8 cm) varied from 0.19 - 2.55 ppm Hg. In the bottom layer the variations were 0.11 - 2.40 ppm. The difference between the bottom and top concentrations within the core ranged from 0 - 2.03. (Oleszkiewicz-Vanderbilt)

MERCURY UPTAKE BY SELECTED AGRICUL-TURAL PRODUCTS AND BY-PRODUCTS, Western Regional Research Lab, Berkeley, Calif. M. Friedman, and A. C. Waiss, Jr. Environmental Science and Technology, Vol 6, No 5, p 457-458, May 1972.

Descriptors: "Sorption, "Mercury, "Agriculture, Proteins, Foods, Environmental effects, Water pollution, Fütration, Water treatment, Public health, Heavy metals, Metals, Pollutant identification.

tion.

Identifiers: *Agricultural products, Mercury uptake, Mercury pollution, Atomic absorption spectroscopy, Organomercurials.

Sorption of mercury compounds from water by various agricultural products was surveyed by specific atomic absorption spectroscopy. The best adsorbents are polyphenolic materials - e.g., tandius - as in walnut expeller meal and peanut skins, and proteins, as in wool and feathers. At low PH, sorption of mercuric salts by wool roughly follows a Freundlich isotherm in the concentration range 0.001-20 g of Hg/l. Namely, $\log x \pm$ approximately $0.33 \log C + 1.9$, in which x mg of Hg are bound per gram of wool from a solution with the residual concentration C, g of Hg/l. Sorption from methylmercuric chloride at pH 6 is about 1/7 - 1/5 as much in the range 0.001-0.2 g of Hg/l. Reducing and alkylating wool with vinylpyridine (for instance) increased sorption 1.7 times. These data indicate the possible use of agricultural products to remove and recover mercury from contaminated materials. (Oleszkiewicz-Vanderbilt) W73-05886

MERCURY EMISSIONS FROM COAL COM-BUSTION,

Environmental Engineering Science, Chestnut Hill, Mass. For primary bibliographic entry see Field 05A. W73-05886

CONTENTS AND BEHAVIOUR OF MERCURY AS COMPARED WITH OTHER HEAVY METALS IN SEDIMENTS FROM THE RIVERS RHINE AND EMS, Institute for Soil Fertility, Haren-Groningen

(Netherlands). A. J. Groot, J. J. M. de Goeij, and C. Zegers. Geologie en Mijnbouw, Vol 50, No 3, p 393-398, 1971. 5 fig. 3 tab, 4 ref.

Descriptors: "Rivers, "Sediments, "Mercury, "Heavy metals, Metals, Manganese, Cobalt, Iron, Copper, Neutron activation analysis, Laboratory test, Analytical techniques, Separation techniques, Sampling, Path of pollutants, Water pollution.

Identifiers: "Rhine River, Mercury pollution, Or-

Mercury is one of the various waste substances transported by the river Rhine across the German-Dutch border. Together with a number of other heavy metals mercury is present in large quantities. Upstream these metals are predominantly fixed to the suspended solids in the water and may be deposited on river flats and flood plains. From the fresh-water tidal area of the river onward, however, these elements are more or less solabilized during their transport as organometallic complexes. The mobilization of mercury is most pronounced in this respect, leading to more normal amounts of this element in sediments from the Wadden Sea. The behaviour of mercury through the whole Rhine estuary as compared with a number of other heavy metals is discussed. As a counterpart of the Rhine the same processes are described for the river Ems. The latter may be regarded as a classic example of an unpolluted stream. (Oleszkiewicz-Vanderbilt)

STUDIES ON THE BIOTRANSFORMATION OF 263 HG-LABELED METHYL MERCURY CHLORIDE IN RATS, Rochester Univ., N.Y. School of Medicine and Dentistry. For primary bibliographic entry see Field 05C.

ROLE OF CADMIUM IN HUMAN AND EX-PERIMENTAL HYPERTENSION, Pennsylvania Univ., Philadelphia. For primary bibliographic entry see Field 05C. W73-05893

W73-05888

USE OF ELECTRICALLY EXCITED OXYGEN FOR THE LOW TEMPERATURE DECOMPOSITION OF ORGANIC SUBSTANCES, Tracertab/West, Richmond, Calif. C. E. Gleit, and W. D. Holland. Analytical Chemistry, Vol 34, No 11, p 1454-1457, October 1962. 3 fig, 2 tab, 7 ref.

Descriptors: *Trace elements, *Tracers, *Analytical techniques, Laboratory equipment, Oxygen, Ion exchange, Radiochemical analysis, Sampling, Testing, Separation techniques, Organic matter, Digestion.

*Radio frequency discharge techniques, Electrically excited oxygen.

A stream of oxygen excited by a radio frequency discharge can be used to decompose organic substances prior to trace element analysis. Biological tissue, graphite, filter paper, and ion exchange resin have been oxidized by this method. Rates of 1 gram per hour can be achieved with a 300-watt, 13.65-Mc oscillator. Temperatures of less than 100 C can be maintained. Radioactive tracer studies demonstrate that 17 representative elements can be quantitatively recovered after complete oxidation of the organic substrate. (Oleszkiewicz-Vanderbilt) W73-05895

A SURVEY OF THE MERCURY POLLUTION PROBLEM IN SWEDEN WITH SPECIAL REFERENCE TO FISH, Havsfiskelaboratoriet, Lysekil (Sweden). H. Ackefors, G. Lofroth, and C-G. Rosen. Oceanography and Marine Biology Annual Review, Vol 8, p 203-224, 1970. 5 fig. 13 tab, 83

Descriptors: *Mercury, *Fish, Food webs, *Reviews, Marine animals, Freshwater, Sediments, Soil, Hazards, Toxicity, Foods, Heavy metals, Metals, Trace elements, Water pollution, Path of pollutants, Birds, Sampling, Testing, Human pathology, Water quality. Identifiers: *Sweden, Methylation, Methylmercury, Japan.

Mercury pollution in Sweden has called attention to a serious problem which embraces hazards for all types of biological ecosystems. The recent finding that other types of mercury compounds may end up as methylmercury by the action of microorganisms occurring in natural waters makes the situation more severe. In about 1% of the waters investigated in Sweden the mean value of mercury concentration in fish exceeds 1000 ng/g; such fish is definitely unfit for human consumption. In addition, mercury residues have been reported in many types of agriculturally produced food and in wildlife. The mercury concentrations seem to be higher in kindeys and liver than in skeletal muscles of terrestrial animals. There are, however, examples of very high concentrations in the flesh of pheasants. In contaminated water, fish has generally higher concentrations in muscles than in liver and kidneys. Mercury concentrations in fish, birds, foods, water and sediments from various places are reported. Accumulation routes and toxicology of the metal to man are discussed. Mercury

ry pollution is not limited to Sweden or Japan. (Oleszkiewicz-Vanderbilt) W73.06907

METABOLISM OF METHYL MERCURY (HG203) COMPOUNDS IN MAN, Kungliga Veterinarhogskolan, Stockholm (Sweden). Dept. of Clinical Biochemistry. For primary bibliographic entry see Field 05C. W73-05898

THE POISON CHAIN FOR MERCURY IN THE ENVIRONMENT, Middlesex Hospital Medical School, London (England). Por primary bibliographic entry see Field 05C. W73-03899

DELINEATION OF AREAS FOR TERRESTRIAL DISPOSAL OF WASTE WATER, Idaho Bureau of Mines and Geology, Moscow. For primary bibliographic entry see Field 05D. W73-05907

WATER WELL STANDARDS: SAN JOAQUIN COUNTY. California State Dept. of Water Resources, Sacramento.

Preliminary edition Bulletin No 74-75, California Department of Water Resources, 1965. 71 p, 2 fig, 10 tab, 11 plates, 5 append.

Descriptors: Wells, "Water wells, Water quality, California, "Standards, Construction materials, "Saline water intrusion, Water levels, Water level fluctuations, Dissolved solids, "Pollution abatement, Shallow wells, Boron, Hardness (Water), Groundwater, Groundwater barriers, Groundwater resources.

Identifiers: Abandonment (Wells), "Sealing (Wells), Contamination.

It was found in a survey of water well construction and sealing practices that in many instances methods of well construction and sealing were not adequate to protect ground water. Most abandoned wells were found not sealed adequately to prevent comingling of water from good and poor aquifers. Despite lowering of ground water levels, no noticeable general degradation of fresh water aquifers had been noticed in the eastern part of the study area. This does not mean that some migration of saline water had not, in fact, occurred. Ground water quality in other sections of the study area is given. It was noted that most well drillers are cognizant of all the features a completed well should have, but due to the competitive nature of their business, they are unable to include all necessary features unless the customer realizes their importance and is willing to pay the extra cost. It is emphasized that adequate well construction and sealing standards must be employed in order to prevent continued degradation of ground water through impre practices that in many instances methods of well construction and sealing were not adequate to protect ground water. Most abandoned wells were found not sealed adequately to prevent comingling of water from good and poor aquifers. Despite lowering of ground water keeks, no noticeable general degradation of fresh water aquifers had been noticed in the eastern part of the study area. This does not mean that some migration of saline water had not, in fact, occurred. Ground water quality in other sections of the study area is given. It was noted that most well drillers are cognizant of all the features a completed well ahoulc have, but due to the competitive nature of their business, they are unable to include all necessary features unless the customer realizes their importance and is willing to pay the extra cost. It is emphasized that adequate well construction and sealing standards must be employed in order to

Group 5B-Sources of Pollution

prevent continued degradation of ground water through improperly constructed and abandoned water wells in San Joaquin County. (Campbell-NWWA) W73-05920

DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS, New York State Dept. of Health, Albany. Radiological Sciences Lab. For primary bibliographic entry see Field 05C.

WATER QUALITY IN A STRESSED ENVIRON-

Burgess Publishing Co., Minnespolis, Minnesota, 1972. W. A. Pettyjohn, editor. 309 p.

Descriptors: Pollutants, *Pollutant identification, Descriptors: Pollutants, "Pollutant identification, Water pollution, "Environmental effects, Geologic control, Groundwater, Groundwater movement, Water wells, Monitoring, Septic tanks, "Water quality, Hydrology, "Hydrogeology, Sampling, Legal aspects, Legalation.

Identifiers: "Groundwater pollution, Infectious

Readings presented are intended to fill the need for reports that adequately describe specific examples of pollution and provide background geologic and hydrologic information. The papers, which have been selected from several sources, deal mainly with groundwater and surface-water contamination. Some topics such as acid water from coal-mining areas, on which much of the literature is highly technical, are only briefly described. The readings have been drawn mainly from scientific journals and governmental publications; most were adopted in their entirety, but a few have been drawn defined. Topics covered by several articles and were adopted in their entirety, but a few have been edited. Topics covered by several articles and papers each include: public water supply, sources of surface-water pollution, geologic controls and groundwater pollution, examples of ground-water pollution, race elements, and legal controls. The environment is stressed in many ways due to a multitude of causes. The nature and severity of the stress are measured and evaluated by many dif-ferent parameters. (Campbell-NWWA) W73-05932

HYDRODYNAMIC INTERACTION OF THER-MAL STRATIFICATION AND RESERVOIR WATER QUALITY, Stone and Webster Engineering Corp., Boston,

Mass. For primary bibliographic entry see Field 05C.

INVESTIGATION OF THE EFFECTS OF SANI-TARY LANDFILLS IN COAL STRIP MINES ON GROUND WATER QUALITY, Martin (A. W.) Associates, King of Prussia, Pa. For primary bibliographic entry see Field 05C. W73-05953

DISPERSION IN NONUNIFORM SEEPAGE, Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering. For primary bibliographic entry see Field 02F. W73-05936

SURFACE JET AT SMALL RICHARDSON NUMBERS NUMBERS, Technical Univ. of Denmark, Copenhagen. Inst. of Hydrodynamics and Hydraulic Engineering. F. Engelund, and F. B. Pedersen. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9588, p 405-416, March 1973. 6 fig, 6 ref, append. Descriptors: *Jets, *Mixing, *Path of pollutants, Stratified flow, Density stratification, Diffusion, Dispersion, Equations.

The spreading of a jet discharged horizontally at the surface of an initially quiescent water of larger density is treated analytically. The equations of continuity and of mass conservation are derived as well as a momentum equation for the longitudinal and for the transverse direction. The entrainment of ambient water into the jet is included in the analysis. The four partial differential equations thus obtained are then transformed into ordinary differential equations by assuming similarity of the velocity profiles and of the density profiles. An exact solution of the equations is obtained for the case of small Richardson numbers. The jet thirkness is proportional to the distance from the outer. The velocity profiles, as well as the density profiles, follow a Gaussian distribution. (Knapp-USGS) W73-05966

VERIFICATION OF PREDICTIONS OF POLLU-TION FROM HIGH ACIDITY IN THE ROUEN REGION (FRANCE) FOR THE WINTER 1969--1970 AND 1970-1971. Institut National de Recherche Chimique Ap-piquee, Vert-le-Petit (France). M. Benarie, and T. Menard. Atmos Environ. Vol 6, No 1, p 65-67. 1972. Identifiers: "Forceasting, "Acidity, France, Rouen, Verification, Winter.

A previously proposed very simple method for short term prediction of episodes of high pollution and approximate estimation of high acidity concentrations was applied to the winters of 1969-1970, and 1970-1971, for verification. In 1969-1970, the predictions were correct for 4 out of the 5 periods in which the pollution level was high, and in 1970-1971, they were correct for 6 out of 8. For several of these periods, the method presented the disadvantage of predicting 1 or 2 false alerts.—Copyright 1972, Biological Abstracts, Inc.
W73-05968

CIRCULATION OF POLIOVIRUS OBTAINED DURING A STUDY OF THE SEWAGE OF BAKU
AND THEIR VIROLOGICAL CHARACTERISTICS (IN RUSSIAN),
F. E. Sadykhova, and A. A. Babaev.
Tr Nauchno-Issled Inst Virusol Mikrobiol Gig. 30:

p 3-9. 1970. Identifiers: *Baku, Circulation, *Enterovirus titer, *Poliovirus, Sewage, USSR, Virological studies.

The spectrum of enterovirus circulation was determined; intratype differences of the isolated poliomyelitis virus were studied; and the dominant type and strain of poliovirus during the period of investigation (1967) was established. An enterovirus titer was determined by a plate method for each month of investigation. No regularity in the change of virus titer depending on the change in temperature, relative humidity, and the level of precipitation was observed.—Copyright 1972, Biological Abstracts, Inc. W73-05969

THE GREAT SALT CONTROVERSY.

Yankee, Vol 37, No 3, p 94-114, March 1973. 1 fig,

Descriptors: "Snow removal, "Roads, "Deicers, "Salts, "Massachusetts, Water pollution sources, Legal aspects, Ecology, Reviews, Evaluation, Pol-lution abatement. Identifiers: *Concord (Mass), *Highway salting.

Over 9 million tons of salt are dumped on the na-tion's highways for ice control each winter. Salt spray from treated roads often injures roadside

vegetation. A decided relationship was found between salt injury symptoms and the distance of trees from the road and their elevation above or below it. Analysis of leaves and twigs of 150 trees showed between 577 and 732 ppm sodium for those within 30 feet of the road as contrasted with 327 to 280 ppm for those farther back. Contamination of water resources is also a problem. The State Highway Department of New Hampshire has been forced to replace a number of wells over the years that have suffered chloride damage. Some have shown counts from 3,550 to 3,800 app. chloride. In 1964 they replaced 37 wells Banox, a rust inhibitor sometimes added to salt, contains sodium hexametaphosphate. It has the potential, as a mutrient source, of stimulating excessive aquatic plant growth in lakes and ponds. Where high-speed travel is not a factor, salting can often be reduced to a negligible minimum or, as in the case of Burlington, Vt., eliminated altogether. (Woodard-USGS)

TIME OF TRAVEL OF A DYE IN QUINNIPIAC RIVER, CONNECTICUT, Geological Survey, Hartford, Conn. M. A. Cervione, Jr.

Connecticut Department of Environmental Protection Bulletin No 2, 1972. 11 p. 5 fig. 4 tab. 4 ref.

Descriptors: "Streamflow, "Flow rates, "Dye releases, "Waste assimilative capacity, "Connec-ticut, Tracking techniques, Fluorescent dye, Path of pollutants, Tracers, Data collections. Identifiers: "Quinnipiac River (Conn), "Time of travel.

The time of travel of water in the Quinnipiac River (Connecticut) was measured in a 30.5-mile reach from the bridge on Milford Street Extension in Plainville to the bridge on State Highway 22 in North Haven. A 20% solution of Rhodamine WT fluorescent dye was used as a tracer during a low-flow period of August 16-27, 1971. Total elapsed time in the reach was 205 hours, and average velocity was 0.22 ft/sec. Flow averaged 62 cu ft/sec at Wallingford, 23.9 miles downstream from Milford Street Extension. This is equivalent to a flow equaled or exceeded 88% of the time. Thus, only 12% of the flows in an average year would be less than that during the study. Time of travel through Hanover Pond, 1.0-mile long, was 55 hours; average velocity was 0.026 ft/sec—the slowest encountered in 10 subreaches. Traveltime in a 5.0-mile subreach from Toelles Road near Wallingford to State Highway 22 at North Haven Wallingford to State Highway 22 at North Haven was 12 hours; average velocity was 0.61 ft/sec—the fastest encountered. (Woodard-USGS) W73-05972

GROUNDWATERS OF THE HERETAUNGA PLAINS, HAWKE'S BAY. Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div. For primary bibliographic entry see Field 04B. W73-05974

RIVER BASIN FRAMEWORK STUDY, SOURIS--RED-RAINY REGION, MOORHEAD, MIN--RED-RAINY REGION, MOORHEAD, MIN-NESOTA.
Souris-Red-Rainy River Basins Commission, Moorhead, Minn.
For primary bibliographic entry see Field 06B.
W73-05979

EFFECTS OF COAL MINING ON THE WATER RESOURCES OF THE TRADEWATER RIVER BASIN, KENTUCKY, Geological Survey, Washington, D.C. H. F. Grubb, and P. D. Ryder. Available from GPO, Washington, D.C. 20402 Price \$2.10. Geological Survey Water-Supply Paper 1940, 1972. 83 p. 26 fig, 20 tab, 38 ref.

Descriptors: "Water pollution sources, "Coal mine wastes, "Mine drainage, "Water quality, "Kentucky, Surface waters, Groundwater, Chemical analysis, Data collections, Hydrologic data, Streamflow, Runoff, Topography, Geology, Sediment transport, Water pollution control, Watershed management.

Identifiers: "Tradewater River basin (KY).

Identifiers: *Tradewater River basin (KY).

The effects of coal-mine drainage on the water resources of the Tradewater River basin, in the western coal field region of Kentucky, were evaluated (1) by synthesis and interpretation of 16 years of daily conductance data, 465 chemical analyses covering an 18-year period, 28 years of daily discharge data, and 14 years of daily suspended-actiment data from the Tradewater River at Olney and (2) by collection, synthesis, and interpretation of chemical and physical water-quality data and water-quantity data collected over a 2-year period from mined and nonmined sites in the basin. Maximum observed values of 13 chemical and physical water-quality parameters were three to 300 times greater in the discharge from mined subbasins. Potasium, chloride, and nitrate concentrations were not significantly different between mined and nonmined areas. Mean sulfate loads carried by the Tradewater River at Olney were about 75% greater for the period 1952-54? than for the period 1952-55. Suspended-sediment loads at Olney for the November-April storm-runoff periods generally vary in response to strip-mine coal production in the basin above Olney. Streamflow is maintained during extended dry periods in mined subbasins have ceased during extended dry periods in mined subbasins after streams in nonmined subbasins have ceased flowing. Some possible methods of reducing the effects of mine drainage on the streams are considered. (Woodard-USGS)

W73-05981

CONCENTRATION AND DISTRIBUTION OF ORGANIC SUBSTANCES IN GROUNDWATER (SODERZHANIYE I RASPREDELENIYE OR-GANICHESKIKH VESHCHESTV V PODZEM-

With Codakil,
All-Union Scientific Research Inst. of
Hydrogeology and Engineering Geology, Moscow
(USSR).
V. M. Shvets.

Akademiya Nauk SSSR Doklady, Vol 201, No 2, p 453-456, 1971. 1 fig, 4 tab, 20 ref.

Descriptors: *Geochemistry, *Groundwater, *Organic matter, Organic coumpounds, Organic acids, Natural gas, Oil, Carbon, Rocks, Water analysis. Identifiers: *USSR.

Identifiers: *USSR.

Organic substances in groundwater have been the subject of study at the Moscow All-Union Scientific Research Institute of Hydrogeology and Engineering Geology since 1953. Over 5,000 analyses of groundwater from 15 regions of the USSR have been made by methods developed mainly at this institute. The most complete picture of the concentration of organic substances in groundwater is provided by a list giving total organic carbon and the concentrations of nonvolatile, neutral volatile, and acid volatile organic compounds. Highest concentrations of organic matter are found in groundwater which is in direct contact with petroleum or gas in oil and gas-condensate deposits, where they reach 370 and 826 mg/liter, respectively. Disregarding the maximum concentrations of organic matter in waters in contact with petroleum and gas reservoirs and assuming an average total organic carbon content of 50 mg/liter, the amount of organic carbon in groundwater of the 5-km zone of stratified rocks is 2.5 times 10 to the twelfth power metric tons. This quantity is commensurate with the concentration of organic carbon in many earth materials and is only less than the amount of organic carbon in sedimentary rocks. (Josefson-USGS)

HOW TO MEASURE THE ILLUMINATION RATE WHEN INVESTIGATING THE RATE OF PHOTOSYNTHESIS OF UNICELLULAR ALGAE UNDER VARIOUS LIGHT CONDITIONS, Copenhagen Univ. (Denmark). Freshwater Biological Lab. For primary bibliographic entry see Field 05C. W73-06002

DETOXIFICATION OF PHOSDRIN (TRADE NAME) BY 'BACILLUS MEGATHERIUM' ENZYMES,

Air Force Armament Lab., Eglin AFB, Fla. J. C. Cornette, B. M. Agerton, and B. C.

Wolverton.

Available from the National Technical Information Service as AD-735 273, \$3.00 in paper copy, \$0.95 in microfiche. AFATL-Technical Report-71-84, July 1971. 12 p, 2 fig, 2 tab, 15 ref.

Descriptors: *Enzymes, *Toxicity, Gas chromatography, Bioassay, Cultures, Ishibition, Biodegradation, Isolation, Organophosphorus pesticides, Fish, Cultures, Degradation (Decomposition), Microbial degradation, Bacteria, Chromatography, Analytical techniques, Pesticides. Identifiers: *Phosdrin, *Detoxification, *Bacillus megaterium, Mosquito fish, Gambusia affinis, Cholinesterase.

Detoxification of the insecticide by the cell-free extracts was verified by bioassays with mosquito fish (Gambusia affinis), by acetylcholinesterase inhibition, and by gas chromatography. The methods employed are described. (Little-Battelle) W72.06018

W73-06005

UTILIZATION OF HYDROCARBONS BY LIPIDS AND PHOSPHOLIPIDS OF CANDIDA LIPOLYTICA GROWN ON HEXADECANE AND ON GLUCOSE MEDIA, National Research Centre, Cairo (Egypt). Biochemistry Dept. M. S. Chenouda, and E. W. Jwaany. Journal of General and Applied Microbiology, Vol 18, No 3, p 181-188, June 1972. 2 fig, 3 tab, 17 ref.

Descriptors: "Lipids, "Yeasts, Chemical analysis, Organic compounds, Microorganiams, S-lvent extractions, Carbohydrates, Cultures. Identifiers: "Phospholipids, "Substrate utilization, "Candida lipolytica, "Hexadecane, "Glucose, "Culture media, Hydrocarbons, Thin layer chromatography, Chemical composition, Substrates, Phosphatidic acid, Cardiolipin, Phosphatidylgycerol, Glycophospholipid, Cephalin, Lecithin, Sphingomyelin, Fatty acids, Wax, Sample preparation.

Lipids were extracted from the cells of Candida lipolytica grown on pure n-hexadecane and on glucose media. The average free lipids produced from each substrate was 7.2 percent and 7.8 percent of cellular dry weight, respectively. Free lipids from the cells grown on each substrate were resolved into 7 fractions by thin-layer chromatography. Quantitative techniques showed that the growth substrate affected the chemical composition of the free lipids. Phospholipids of C. lipolytica grown on n-alkane and on glucose media consisted of, at least, seven different components. These are phosphatidic acid, cardiolipin, phosphatidylycerol, glycophospholipid (glucose is the sugrabase), cephalin, lecithin, and sphingomyelin. (Holoman-Battelle) W73-06007

METALS AS POLLUTANTS IN AIR AND WATER, Ocean Engineering Information Service, La Jolla,

For primary bibliographic entry see Field 05A. W73-06009

FERMENTATION INDUSTRY - PHARMACEU-PERMINIATION INJURIES
TICALS, CORN, SUGAR,
Oklahoma State Univ., Stillwater.
A. F. Gaudy, Jr.
Journal Water Pollution Control Federation, Vol
44, No 6, p 1044-1046, June 1972. 17 ref.

Descriptors: "Fermentation, "Waste water (Pollution), "Organic wastes, "Corn (Field), "Sugar crops, "Reviews, Industrial wastes, Biochemical oxygen demand, Chemical oxygen demand, Waste water treatment, Water pollution sources, Yeasts, Chemical treatment, Antibiotics (Pesticides), Activated chiefe. tivated sludge.

Identifiers: *Pharmaceuticals, Chemical composi-tion, Characterization, Breweries, Saccharides, Biomycin.

Wastes associated with the fermentation industry (pharmaceuticals, corn, sugar) are considered in this literature review in relation to their (1) chemical composition, (2) being a source of water pollution, and (3) treatment. (Holoman-Battelle) W73-06010

MICROFLORA OF ACTIVATED SLUDGE, Massey Univ., Palmerston North (New Zealand). Dept. of Biotechnology. For primary bibliographic entry see Field 05A. W73-06011

AQUATIC-BIOTIC COMMUNITY STRUCTURE AS AN INDICATOR OF POLLUTION, Geological Survey of Alabama, University. For primary bibliographic entry see Field 05A. W73-06018

A THERMAL FLUID-MECHANICAL MODEL FOR ESTIMATION OF POWER PLANT IM-PACT ON A STRATIFIED LAKE, Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center. F. K. Moore.

F. K. Moore. Available from National Technical Information Service as PB-216 804; \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No. 36, 1971. 27 p, 7 fig, 1 tab, 8 ref, append. OWRR A-034-NY (1). 14-31-0001-2322.

Descriptors: Heat, Hydrodynamics, Lakes, "Powerplants, "Stratified flow, "Temperature, "Thermal capacity, "Diffusion, Mathematical models, Mixing, Seasonal, Thermockine, "Thermal pollution, Water pollution effects, Heated water, Thermal stratification.

Thermal stratification.

The natural thermal cycle of a stratified water body used for power-plant cooling will be disturbed both by heat addition and the mixing effect of withdrawal and return. A perturbation analysis for these effects is made with a model based on the assumption that a Richardson number is constant at the base of any stratified layer. On a further assumption about the profiles of wind-driven return currents, constant heat flux from that layer is inferred. This heat flux, and the diffusion coefficient at the thermocline, are the critical parameters of the simple, one-dimensional, line-segment model, and are chosen to give good imitation of the known natural cycle of Cayuga Lake. The model is then perturbed in terms of both heat flux and diffusion to give power-plant impact for that lake. Both transient and final cycle changes of summer and winter temperatures and stratification and overturn are calculated. The heat and diffusion effects are comparable, and the latter may be dominant if the discharge is diluted to meet a thermal standard. Implications as to strategy of water use are developed.

W73-06023

NUTRIENTS IN THE PAMLICO RIVER ESTUA-RY, N.C., 1969-1971, North Carolina Water Resources Research Inst.,

Group 5B-Sources of Pollution

For primary bibliographic entry see Field 05C. W73-06025

PLANKTON POPULATIONS AND SOME EF-FECTS OF MINE DRAINAGE ON PRIMARY PRODUCTIVITY OF THE COEUR D'ALENE RIVER, DELTA, AND LAKE, Idaho Univ., Moscow. Water Resources Research

For primary bibliographic entry see Field 05C.

PHYSIOLOGY AND NATURAL DISTRIBUTION OF THE BACTERIUM CARYOPHANON LATUM, Missouri Water Resources Research Center, Rol-

For primary bibliographic entry see Field 05C. W73-06032

INVESTIGATION OF PRESENT THERMAL REGIME OF MISSOURI RIVER IN MISSOURI, Missouri Water Resources Tesearch Center, Rol-

Available from the National Technical Informa-tion Service as PB-216 814, 33.00 in paper copy, 80.95 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, December, 1972. 107 p, 32 fig, 3 tab, 34 ref. OWRR B-045-MO (1), 14-01-0001-3299.

Descriptors: *Temperature, *Fourier analysis, *Thermal pollution, *Missouri River, Missouri, *Thermal politition, misseum Water temperature.
Identifiers: *Power spectral analysis.

Equipment was assembled to measure temperature to 0.001C in water depth up to 100 feet and velocities up to 10 miles per hour. Assistance provided by the Rolla staff of the U.S. Geological Survey Water Resources Division included loan of hoisting equipment. Data were accumulated from Hermann, and Boonville, Missouri, where bridges provide access, and where the U.S.G.S. had previously obtained separate four- and five-year continuous records of surface water temperature. Computer programs were developed for Fourier and Power Spectral Analysis of the temperature fluctuations. Application of these to available data showed, as expected, a very large spectral spike at one cycle per year. Analysis of the residual variations revealed high spectral strength between zero and one CPY, attributable to long-term fluctuations, and at 2.5 and 5 CPY, of unknown cause. Power spectral density analysis of yearly records revealed significant peaks, in the 1-10 CPY range, which shifted with time. This discovery led to design of equations which successfully predicted, with a maximum error of 5F, daily average river temperatures for at least 60 days in advance, using the previous 365 daily average values. Other analysis identified spectral peaks of 30, 52 (weekly) and 365 (daily) CPY, and detected a weekly cyclic test input of 0.1F. vas assembled to measure tempera-

RECLAIMING ZINC FROM AN INDUSTRIAL WASTE STREAM. For primary bibliographic entry see Field 05D. W73-06044

WASTE WATER CLASSIFICATION B' GRAVITATIONAL ELECTRODIALYSIS, Rutgers - The State Univ., New Brunswick, N. J. For primary bibliographic entry see Field 05D. W73-06054

A PREDICTIVE MODEL FOR WATER POLLU-TION, New Mexico Univ., Alberquerque. L. H. Baker, Jr.

University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich. 48106, Order No. 70-12, 597, Xerox copy \$9.70, Microfilm \$4.00. Ph. D. Dissertation, 1969, 215 p.

Descriptors: "Waste water (Pollution), "Oxygen demand, Mathematical models, "Organic wastes, Nutrients, Biochemical oxygen demand, Ef-fluents, "New Mexico, Waste water treatment. Identifiers: "Las Cruces (N. Mex).

By measuring the oxygen demand for a continuous flow, completely mixed, 12-liter reactor over a period of 120 days, data were collected for the construction of a mathematical model for organic water pollution level. As a check on system performance, primary effluent was procured from the Las Cruces Sewage Treatment Plant and used as a controllable nutrient source for two laboratory experiments. Even though further work is needed on the reactor and the sampling method, it is felt that this method of monitoring organic wastes could be developed into a valuable means of continuously monitoring the organic content of a wastewater. (MOTS-60818-Texas) W73_06055

A LEAST-COST ANALYSIS FOR THE HOUSTON SHIP CHANNEL, Texas Univ., Austin.

J. A. Hays, Jr.
Available from University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich 48106, Order No. 70-18, 247, Xerox copy \$11.50; Microfilm \$4.00. Ph. D. Dissertation, 1970, 253 p.

Descriptors: *Systems analysis, Algorithms, Waste treatment, Biological treatment, Estuarine eavironment, Optimization, *Cost analysis, *Mathematical models, Aerobic conditions, *Finite element analysis, Water quality, *Texas,

Poissolved oxygen.
Identifiers: "Houston Ship Channel, Benthal deposits, Implicit enumeration, Nonlinear programming, Waste dischargers.

A finite-difference, steady-state mathematical model was employed to predict summer dissolved oxygen profiles resulting from wastewater discharges and other influences for a one-dimensional, homogenous estuarine system such as the Houston Ship Channel. Results show that substantial savings could be made through the application of system analyses and optimization methods to water quality problems on the upper reaches of this channel. Large benthal deposits can apparently prevent aerobic conditions from occurring in the Upper Channel even when biological waste treatment is necessitated for all waste dischargers. (Gottschalk-Texas)

CLEAN WATER THROUGH DREDGING, Ellicott Machine Corp., Baltimore, Md. For primary bibliographic entry see Field 05G. W73-06066

MICROBIOLOGICAL QUALITY OF SUBSURFACE DRAINAGE WATER FROM IRRIGATED AGRICULTURAL LAND, Agricultural Research Service, Kimberly, Idaho.

Agrication are received from the control of the con

Descriptors: *Irrigation water, Groundwater, *Bacteria, *Coliforms, Water pollution, Groundwater movement, Water pollution sources, Water pollution control, Water quality, *Idaho, Path of pollutants. Identifiers: Fecal coliforms.

Irrigation and subsurface drainage waters were sampled from a district in southern Idaho and evaluated for bacteriological quality. The sampling took place in the summer of 1969 at two week intervals. From 140 to 3,300 coliforms per 100 ml were contained in the diverted irrigation water. However, 86% of the subsurface drainage samples contained 5 or fewer coliforms per 100 ml. Apparently percolation through the soil improved the water quality almost to domestic water standards. (Smith-Texas)

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PHOSPHATES IN DETERGENTS - BANE OR

BOON, North Carolina Univ., Chapel Hill. Dept. of Eavironmental Sciences and Engineering. For primary bibliographic entry see Field 05C. W73-0689

LAND AND WATER POLLUTION FROM RECREATIONAL USE. National Industrial Pollution Control Council, Washington, D.C.

Report prepared for the Secretary of Com December 13, 1971, 21 p, 4 photo, 1 append.

Descriptors: "Water pollution, "Water pollution sources, "Recreation, "Recreation wastes, "Land resources, Land use, Water resources, Education, Environment, Aesthetics.
Identifiers: "Land pollution, "Leisure activity, Outdoor recreation, Natural beauty.

The impact of leisure activity or outdoor recrea-tion upon land and water pollution for the leisure industry are discussed. No industry has as large a tion upon land and water pollution for the leisure industry are discussed. No industry has as large a stake in clean water or in the preservation of natural beauty, since its very existence is dependent upon the purchasers of its products and services finding opportunities to engage in leisure pursuits in the most pleasant surroundings. Recommendations include that manufacturers of recreational equipment continue efforts to minimize any adverse impact from their products; that an educational campaiga begin to acquaint citizens with the fragility of some environments and the need for individual responsibility for their protection; that the federal government establish a demonstration program providing for a recreational area limited to those users who demonstrate sound knowledge of environmental concepts and practises; and that a self-help pollution analysis form such as described be distributed to appropriate trade associations and be given to their members to assist them in the identification of sources of pollution and to determine what actions to take. (Davis-Chicago)

EDDY DIFFUSIVITY AND VELOCITY PROFILES FOR A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN CHANNEL,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 08B.
W73-06098

THERMAL DISPERION IN A STREAM MODEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. For primary bibliographic entry see Field 02E. W73-06092

PROFILES

VELOCITY PROFILES AND CHARAC-TERISTICS OF A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN CHANNEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. For primary bibliographic entry see Field 08B. W73-06100

ANALYSIS OF THE DISPERSION OF THER-MAL EFFLUENTS, Rutgers - The State Univ., New Brunswick, N.J. Coll. of Engineering. Coll. of Engineering.
B. M. Mehta, and R. C. Ahlert.
Chemical Engineering Progress Symposium Series, Vol 67, No 119, p 126-133, 1971, 4 fig. 17 ref.
OWRR-A-019-NJ (8).

Descriptors: Velocity, Turbulent flow, *Dispersion, *Diffusivity, Temperature, *Thermal pollution, *Model studies, Eddies, Open channel flow.

The equation of motion with constant coefficients, representing average turbulent diffusivities, is a poor model of momentum transport in open-channel flow. The equation of motion with variable coefficients, derived from the logarithmic 'Law of the Wall,' is qualitatively superior to the constant coefficient case but lacks quantitative accuracy. A rapidly convergent solution of the equation of motion, with variable coefficients, has been demonstrated. A new model for momentum eddy diffusivities, providing for transport in 'core' flow, generates excellent estimates of velocity profiles no open-channel flow. The new diffusivity model and revised velocity profiles are compatible with an existing model for the dispersion of thermal effluents. The equation of motion with constant coefficients, fluents. W73-06102

WATER QUALITY MONITORING IN DISTRIBUTION SYSTEMS: A PROGRESS RE-PORT, National Sanitation Foundation, Ann Arbor, Mich. For primary bibliographic entry see Field 05A. W73-06126

IDENTIFICATION SYSTEM FOR WATER POL-LUTION DETECTION, For primary bibliographic entry see Field 05A. W73-06134

THE ROLE OF SUBAQUEOUS DEBRIS FLOW IN GENERATING TURBIDITY CURRENTS, Rhode Island Univ., Kingston. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-06173

TRAVEL TIME FOR SOLUTES, UPPER SABINE RIVER BASIN, TEXAS, APRIL 16-30, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-06174

INVESTIGATION ON THE RIVER WATER POLLUTED WITH ACIDIC HOT SPRING WATER, WATER, Kajima Inst. of Construction Technology, Tokyo (Japan). A. Ariizumi. Water Research, Vol 7, No 3, p 385-394, March 1973. 4 fig, 5 tab, 5 ref.

Descriptors: *Acid streams, *Acidic water, *Neutralization, *Hot springs, Water treatment, Water pollution control. Identifiers: *Japan.

ramagawa not spring in Akita Prefecture, Japan, discharges hot water containing hydrochloric acid (pH-1) at 140 liters per sec. This flows into the Tama River, with the result that the river has been unusable for hydropower development thus far. For the purpose of mitigating the acidity of the river water, the hot spring water is carried away through channels and infiltrated into the soil of a mountainside for chemical neutralization by Tamagawa hot spring in Akita Prefecture, Japan, nside for chemical neutralization

seepage before flowing into the river. Neutraliza-tion following the injection of hot-spring water into the soil is about 80% effective. The pH of the into the soil is about 50% effective. The pri or the water in the reservoir to be constructed downstream of the river should not exceed 5. Even in the absence of treatment, acidity is reduced by the alkalinity of the tributary waters as well as by dissolution of river-bed components by the acid. (Knapp-USGS) W73-06180

EFFECTS OF IMPOUNDMENT ON THE WATER QUALITY OF THE BIGHORN RIVER, Montana State Univ., Bozeman. Dept. of Botany and Microbiology.

R. A. Soltero, J. C. Wright, and A. A. Horpestad.
Water Research, Vol 7, No 3, p 343-354, March 1973. 4 fig. 7 tab, 19 ref. FWPCA 18050 DBW FWPCA Grant ITI-WP-228.

Descriptors: "Water quality, "Reservoirs, "Mon-tana, Dissolved oxygen, Alkalinity, Nitrates, Nitrogen, Water temperature. Identifiers: "Bighorn Reservoir (Mont).

Water flowing through Bighorn Lake, Montana, a new impoundment on the Bighorn River, undergoes physical and chemical changes. Turbidity is greatly reduced and most dissolved constituents decrease in concentration. Potassium was unchanged over 2 yr of record, and magnesium, sodium, and sulfate diminished one year and increased the next. Nitrate was augmented in the reservoir but other nitrogen compounds were reduced. Photosynthesis did not reduce alkalinity; decrease of alkalinity is assumed to reflect dilution. Passage through the reservoir delayed conductivity changes evident in the river above, and the mass of stored water was much more resistant to seasonal temperature changes. (Knapp-USGS) W73-06181

A MATHEMATICAL MODEL FOR THE PRE-DICTION OF UNSTRADY SALINITY INTRU-SION IN ESTUARIES, Massachusetts Inst. of Tech., Cambridge. For primary bibliographic entry see Field 02L. W73-06183

EVALUATION OF WASTE WATERS FROM PETROLEUM AND COAL PROCESSING, Oklahoma Univ., Norman. School of Civil En-gineering and Environmental Science. For primary bibliographic entry see Field 05D. W73-06208

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS, URS Research Co., San Maio, Calif. J. D. Sartor, and G. B. Boyd. Copy available from GPO Sup Doc as EPI.23]c.72-081, \$3.00. Environmental Protection Agency Technology Series Report EPA-R2-72-081, November 1972. 236 p. 45 fig. 51 tab, 71 ref, 8 append. EPA Project 11034 FUJ. 44-12-921.

Descriptors: *Storm runoff, Surface runoff, Urban runoff, *Pollution (Water), Solids, Heavy metals, Biochemical oxygen demand, Chemical oxygen demand, Water pollution sources, Pollu-tant identification. Identifiers: *Street cleaning, *Street surface con-

Materials which commonly reside on street surfaces have been found to contribute substantially to urban pollution when washed into receiving waters by storm runoff. In fact, runoff from street surfaces is similar in many respects to sanitary sewage. Calculations based on a hypothetical but typical U.S. city indicated that the runoff from the first hour of a moderate-to-heavy storm would contribute considerably more pollutional load than

would the same city's sanitary sewage during the same period of time. This study provides a basis for evaluating the significance of this source of water pollution relative to other pollution sources and provides information for communities having a broad range of sizes, geographical locales, and public works practices. Information was developed for major land-use areas within the cities (such as residential, commercial and industrial). Runoff was analyzed for BOD, COD, total and volatile solids, Kjeldahl mitrogen, nitrates, phosphates, and a range of pesticides and heavy metals. (EPA)

A PRESSURE SEWER SYSTEM DEMONSTRA-TION, Environmental Protection Agency, Washington, For primary bibliographic entry see Field 05D. W73-06213

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT, Iowa State Univ., Ames, Dept. of Agricultural Engineering. For primary W73-06214 ary bibliographic entry see Field 05G.

NITROGEN CONTENT OF GROUND WATER IN KINGS COUNTY, LONG ISLAND, NEW YORK, Geological Survey, Mineola, N.Y. G. E. Kimmel. In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D199-D203, 1972. 2 fig, 4 tab, 10 ref.

Descriptors: "Water pollution sources, "Ground-water, "New York, "Nitrates, "Sewage effluents, "Leakage, Septic tanks, Path of pollutants, Ur-banization. banization. Identifiers: *Kings County (N Y).

Under native conditions almost all the nitrogen is groundwater on Long Island is in the form of nitrate. The estimated nitrate content of groundwater in Long Island's aquifers under native conditions is 0.2 mg/liter. Because the NO3 content of water in the upper glacial aquifer generally exceeds 0.2 mg/liter, contamination by the activities of man is indicated. In 1942 and in 1970-71, the of man is indicated. In 1942 and in 1970-71, the NO3 content of water from the upper glacial aquifer generally exceeded 0.2 mg/liter in most of Kings County; locally it as as much as 28 mg/liter. NO3 content of water in the underlying Jameco aquifer locally was as much as 9.6 mg/liter in 1942. Septic-tank and cesspool effluents were probably the chief source of the nitrogen in groundwater in Kings County before and during the early 1900's. Continued high levels of nitrate since the elimination of sentic tanks and construction of sentic tanks and construction of Continued high levers of nursue since the elimina-tion of septic tanks and construction of sewers suggest that leakage from sewers may be a prin-cipal source of the nitrate in the groundwater of the county. (Knapp-USGS) W73-06219

INVESTIGATION OF THE OCCURRENCE AND INVESTIGATION OF THE OCCURRENCE AND TRANSPORT OF ARSENIC IN THE UPPER SUGAR CREEK WATERSHED, CHARLOTTE, NORTH CAROLINA, Geological Survey, Raleigh, N.C. H. B. Wilder. In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D205-D210, 1972. 3 fig, 2 tab, 1 ref.

Descriptors: "Path of pollutants, "Arsenic com-pounds, "Bottom sediments, Water pollution sources, Industrial wastes, Trace elements, Poisons, Chromium, Streamflow, Adsorption. Identifiers: "Arsenic, Antimony.

Group 5B-Sources of Pollution

During the months of June and July 1971, the U.S. During the montants of Julie and July 1917, tale 0:3.
Geological Survey made a special study of the occurrence and transport of arsenic in the Sugar
Creek, S.C., drainage area. During the week of
June 29-July 5, despite the fact that no known
disposal of arsenic wastes had taken place in over
3 months, total arsenic concentrations ranging disposal of arsenic wastes had taken place in over 3 months, total arsenic concentrations ranging from 115 to 260 micrograms per liter were still entering the tributary Irwin Creek through a sewage treatment plant. The most contaminated phase of the aqueous system was suspended solid material in the treated sewage, which contained arsenic in amounts of 24,400 to 500,000 micrograms per kg. Arsenic was concentrating in the streambed materials, which, on June 28, contained concentrations of from 7,000 to 35,000 micrograms per kg. On July 29-31, 1971, samples were taken at Sugar Creek near Fort Mill S.C., during a minor flood. During the flood most of the arsenic was transported in the suspended-sediment phase and arsenic discharge closely paralleled total suspended-sediment discharge. On February 25, 1972, dried sludge from storage beds at the treatment plant contained as much as 1,700,000 micrograms per kg of Sb, and 120,000 micrograms per kg of Cr. (Knapp-USGS) W73-06220

HYDRAULIC SAND-MODEL STUDIES OF MIS-CIBLE-FLUID FLOW, Geological Survey, Lakewood, Colo. For primary bibliographic entry see Field 02L. W73-06226

ROLE OF CLAY MINERALS IN THE ACCUMU-LATION AND TRANSFORMATION OF OR-GANIC MATTER IN RECENT SEDIMENTS OF THE CASPIAN SEA (O ROLI GLINISTYKH MINERALOV V NAKOPLENII I PREOBRAZOVANII ORGANICHESKOGO VESHCHESTVA V SOVREMENNYKH OSAD-KAKH KASPIY SKOGO MORYA), Azerbaidzhanskii Nauchno-Issledovatelskii In-stitut po po Dobyche Nefti, Baku (USSR). For primary bibliographic entry see Field 02J. W73-06233

DISTRIBUTION OF BROMINE IN BRINES AND SALT FORMATIONS OF THE GULF OF KARA-BOGAZ-GOL (RASPREDELENIYE BROMA V RASSOLAKH RASSOLAKH I SOLYANYKH OBRAZOVANIYAKH ZALIVA KARA-BOGA-

Litologiya i Poleznyye Iskopayemyye, No 1, p 99-104, January-February 1972. 2 fig. 3 tab, 10 ref.

tors: *Geochemistry, *Halogens, ne, *Brines, *Salts, Rocks, Basins, Saline water, Sanues, "Bines, "Salta, Rocks, Basins, Saline water, Sea water, Evaporation, Diagenesis. Identifiers: "USSR, "Caspian Sea, "Kara-Bogaz-Gol, Halite, Glauberite, Astrakhanite, Diastrophism.

Studies were made of the distribution of bromine in surface, intercrystalline, and basal salt formations of Kara-Bogaz-Gol, an inlet of the East Caspian Sea. The percentage of bromine in brines and halite rocks of the Caspian is 0.0005, whereas in sea water it is significantly higher (0.0066). On the basis of bromine behavior in intercrystalline brines, the Kara-Bogaz-Gol salt basin is divided into two zones: an inner zone where bromine accuinto two zones: an inner zone where bromine accu-mulation is intensive; and an outer zone where bromine is dispersed as a result of continental ruoronime is unpersect as a result of continental runoff. The concentration of bromine in present-day and ancient halite, halite-glauberite, and halite-astachanite rocks is comparable and attests to the great stability of isomophous bromine in halite during the diagenesis of salt formations. (Josefson-USGS) W73-06234

HYDROGEOCHEMISTRY OF THE SIVASH SALT MARSHES AND PEREKOP LAKES (O GIDROGEOKHIMII SIVASHA I PEREKOP-SKIKH OZER), For primary bibliographic entry see Field 02H. W73-06235

ORGANOCHLORINE PESTICIDES IN RAIN-WATER, OAHU, HAWAII, 1971-1972, Hawaii Univ., Honolulu. Dept. of Agricultural Biochemistry.

A. Bevenue, J. N. Ogata, and J. W. Hylin.
Bulletin of Environmental Contamination and Toxicology, Vol 8, No 4, p 238-241, October 1972. 3 tab, 10 ref.

Descriptors: "Chlorinated hydrocarbon pesticides, "Rain water, "Snow, Water analysis, "Gas chromatography, Pesticide residues, Dieldrin, Pollutant identification, Hawaii, Organic pesticides, Halogenated pesticides, DDT, Polychlorinated biphenyls, Hawaii.
Identifiers: Detection limits, Lindane, Chlordane, Pentachlorophenol, p p'-DDT, Sample preparation.

Pesticide residue data were obtained from rainwater samples in Hawaii for the period 1971-1972. Samples were collected in one-gallon glass containers protected from sunlight with a covering of aluminum foil. Precautionary measures against contamination during sampling and analysis were taken. Analysis of the samples for residues was made by gas chromatography. The methyl and ethyl ether derivatives of pentachlorophenol (PCP) were prepared for gas chromatography and a third derivative, pentachlorophenyl acetate, was also used for the confirmation of the presence of PCP. A sample of snow from Mauna Kea Summit (13,800 ft) and a sample of water from Lake Waisu fed almost exclusively by the Summit snows) from the island of Hawaii were also examined for pesticides. The total organochlorine residues in Hawaiian rainwater are in the low parts per trillion range and are comparable to previous analyses made during the period 1970-1971. The residue values for the snow and lake water were in the same range noted in the rainwater. Under the conditions of this study, no PCB's were detected. The pesticides observed could be readily detected at the ppt level; however, PCB's such as the Aroclors 1248, 1254, and 1232, would require about 20 to 40 ppt of each for minimum detection. (Holoman-Battelle)

GAS CHROMATOGRAPHIC DETERMINATION OF THE RATE CONSTANT FOR THE HYDROLYSIS OF HEPTACHLOR, Department of the Environment, Ottawa (Ontano). Water Quality Div.

A. Demayo.

Bulletin of Bavironmental Contamination and Toxicology, Vol 8, No 4, p 234-237, October 1972.

3 fig. 8 ref.

Descriptors: "Heptachlor, "Hydrolysis, Chemical reactions, Chemical degradation, Aqueous solutions, Chlorinated hydrocarbon pesticides, Water analysis, "Gas chromatography, Least squares method, Halogenated pesticides, Organic comcides, Pollutant identification, Organic com-

pounds. Identifiers: *Distilled water, *Electron capture gas chromatography, *Fate of pollutants, Half-life, Hydrotysis constant.

Gas chromatography has been used to determine the rate of hydrolysis of heptachlor in distilled water. One hundred microliters of a stock solution of 3 micrograms/mi of heptachlor were added to a flask to which 90 ml of distilled water were also added. The flask was placed in a constant temperature (22.88 plus or minus 0.03 C) water bath. At various time intervals flasks were removed from

the bath and the contents analyzed immediately for heptachlor. The analytical procedure involved adding 1 ml of benzene, stirring vigorously on a magnetic stirring plate for half an hour, and then letting the flask stand for approximately 10 minutes to allow the benzene layer to separate on top. The benzene layer was removed using a syringe and place in 100-microliter vials for direct use in the automatic nijector of the electron capture detector-equipped gas chromatograph. The quantity of unhydrolyzed heptachlor remaining in each flask was calculated by interpolation from a standard curve. The results were analyzed by a first order or pseudo-first order kinetics and the hydrolysis constant k was calculated by the least squares method. The value of k at 29.83 C was 0.0300 plus or minus 0.0008/hr and the half-life of heptachlor at the same temperature was 0.693/k or 23.1 hr. (Holoman-Battelle)

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POLYCHLORINATED BIPHENYLS: PHOTOLYSIS OF 3,4,3',4'-TETRACHLOROBIPHENYL AND 4,4'-DICHLOROBIPHENYL IN SOLU-

Descriptors: "Aqueous solutions, "Chemical reactions, "Ultraviolet radiation, "Polychlorinated biphenyls, Degradation (Decomposition), Gas chromatography, Mass spectrometry, Pollutant identification, Organic compounds. Identifiers: "Photolysis, 3 4 3'-tetrachlorobiphenyl, 4 4'-dichlorobiphenyl, "Metabolites, Dechlorination, Mass spectra, Hexane, 3 4 3'-trichlorobiphenyl, Photoproducts, Sample preparation, Fate of pollutants, Organic solvents.

Upon the photodecomposition of 3,4,3',4'-tetrachlorobiphenyl and 4,4'-dichlorobiphenyl in hexane solution at 300 nm, there is stepwise dechlorination. Ten mg each of the tetra5- and the dichlorobiphenyl were photolyzed under UV light for 36 and 150 hours, respectively, in sealed borosilicate test tubes, using a Rayonette reactor equipped with RUL 3000, Bl lamps. The products were resolved and their mass spectra obtained with a LKB 900 GC-mass spectrometer. The retention times for the photoproducts of 3,4,3',4'-tetrachlorobiphenyl and 4,4'-dichlorobiphenyl are found to be identical with those of standards. With 3,4,3',4'-tetrachlorobiphenyl, mass spectrometry revealed a tetrachlorinated biphenyl at 22.83 min (m/e 290), a trichlorinated biphenyl and 1.86 min (m/e 250) and a dichlorinated one at 5.27 min (m/e 222). It was concluded that the peak at 10.86 min corresponds to 3,4,4'-trichlorobiphenyl and that 3,4,3'-trichlorobiphenyl is not formed in mm (m/e 222). It was concluded that the peak at 10.86 min corresponds to 3,4,4'-trichlorobiphenyl and that 3,4,3'-trichlorobiphenyl is not formed in the reaction since no 3,3'-dichlorobiphenyl is found among the products. The two peaks obtained from the 4,4'-dichlorobiphenyl photolysis corresponded with standard samples of 4-chlorobiphenyl and starting material. (Holoman-Battelle) W73-06272

IN VIVO AND IN VITRO EPOXIDATION OF ALDRIN BY AQUATIC FOOD CHAIN ORGAN-Univ., Chicago. Dept. of Biological

M. A. Q. Khan, A. Kamal, R. J. Wolin, and J.

Runnels.
Bulletin of Environmental Contamination and
Toxicology, Vol 8, No 4, p 219-228, October 1972.
1 fig., 4 tab, 13 ref.

Descriptors: *Path of pollutants, *Food chains, Aquatic environment, *Dieldrin, *Aldrin, *Bioas-

say, Chlorinated hydrocarbon pesticides, Invertebrates, Absorption, Metabolism, Chemical reactions, Protozoa, Dinoflagellates, Crustaceans, Amphipoda, Daphuia, Gas chromatography, Annelids, Isopods, Copepods, Diptera, Mullusks, Gastropods, Dieldrin, Caryfish, Mosquitoes, Snails, Dragonflies, Worms, Clams, Chlorophya, Pyrrophyta, Diatoms, Chrysophyta, Chlorophya, Pyrrophyta, Diatoms, Chrysophyta, Mussels, Raxymes, Halogenated pesticides. Identifiers: "Epoxidation, "Fate of pollutants, 'Oxidase, Macroinvertebrates, Biological magnification, Electron capture gas chromatography, Microsomes, Sample preparation, Enzyme preparation, Chemical recovery, Metabolites, Asellus, Decapods, Cyclops, Cambarus, Hydra litoralis, Dugesias, Flatworms, Turbellaria, Leeches, Gammarus, Daphnia pulex, Aeshaa, Aedes aegypti, Anodonta, Lymnaea palustris, Coelenterates, Intestine, Tissue, Gills, Muscle, Heart, Kidneys, Liver, Hepatopancreas, Halobdellastagnalis.

Liver, Hepatopancreas, Halobdellastagnalis.

Preliminary results from in vivo and in vitro studies demonstrate the activity of the mixed-function microsomal oxidase system in relation to the ability of some freshwater organisms to withstand toxicants or biocides. In vivo studies involved the exposure of Chlorella diatoms, dissoflagellates, and mixed-protozoa in 100 ml of water contining 0.1 ppm aldrin for 24 hr. The water was extracted and evaporated to dryneas, the residue redissolved in hexane after adding sodium sulfate and analyzed by gas chromatography. In vivo exposure was similar using 50 organisms/container (Hydra, Dugesia, Leeches, Asellus, Gammarus, Daphnia, Cyclops, and Aedes larvae) exposed to 0.1 ppm aldrin for 2 hr. Crayfish and dragorfly nymphs were exposed to 0.25 ppm aldrin for the same time, and Anodonta and Lymnae were exposed for 4 hr. After exposure the small organisms were homogenized as a whole and the larger animals were dissected and their viscera homogenized and prepared for analysis by gas chromatography. Only crayfish, snall and mussel tissues were used for the in vitro assay of the microsomal mixed-function oxidase. The planktonic part of the freshwater ecosystem is capable of absorbing insecticides as judged by the amount of dieldrin in these organisms. The amount of dieldrin formed is low in the algae and high in the protozoa. These organisms appear endowed with an enzyme system which can epoxidize aldrin. These aquatic invertebrates can absorb aldrin directly from the medium. The amount of insecticide, aldrin and its epoxide dieldrin, present in the bodies of four smaller invertebrates increases in the following order (on per individual basis): Gammarus less than Dugenis less than Dugenis less than Dugenis less than Cyclope less than activity was in the green gland (kidney). (Holoman-Battelle)

MERCURY RESIDUES IN FISH FROM SASKATCHEWAN WATERS WITH AND WITHOUT KNOWN SOURCES OF POLLUTION - 1976, Saskatchewan Univ., Saskatoon. Coll. of Home Economics.
For primary bibliographic entry see Field 05A.

PESTICIDE RESIDUES IN SOIL FROM EIGHT CTTES - 1969, Environmental Protection Agency, Washington, D.C. Pesticides Regulation Div. For primary bibliographic entry see Field 05A. W73-06276

RESIDUES IN FISH, WILDLIFE, AND ESTUA-RIES. MERCURY CONCENTRATIONS IN GAME BIRDS, STATE OF WASHINGTON - 1970 AND 1971, Hanford Environmental Health Foundation, Richland, Wash. For primary bibliographic entry see Field 05A. W73-06277

RADIOECOLOGY OF ZN-65 IN ALDER SLOUGH, AN ARM OF THE COLUMBIA RIVER ESTUARY, Oregon State Univ., Corvallis. Dept. of Oceanography.

W. C. Renfro.

Available from the National Technical Information Service as RLO-1750-46, 33.00 in paper copy, 30.95 in microfiche. Report No RLO-1750-46, 1970. 43 p. 22 fig. 3 tab, 18 ref. Contract No. AEC AT (45-1)-1750.

Descriptors: Water analysis, *Sediments, Fish, *Shrimp, Aquatic plants, *Algae, *Zinc radioisotopes, *Amphipoda, Rivers, Estuaries, Radioactivity techniques, Zinc, Metals, Heavy metals, Crustaceans, Invertebrates, Chlorophyta, Isopods, Carp, Salmo, Sticklebacks, Perches, Bass, Sculpins, Chinock salmon, Water pollution sources, Absorption, Spectrophotometry, Analytical techniques, Water pollution effects, Path of pollutants, *Columbia River.
Identifiers: Sample preparation, *Zn-65, Shiner

pollutanta, *Columbia River.
Identifiers: Sample preparation, *Zn-65, Shiner
perch, Biological samples, Atomic absorption
spectrophotometry, Alder Slough, Scintillation
counting, Co-precipitation, Macroinvertebrates.

The transfer of Zn-65 through a small estuarine ecosystem was investigated by determining seasonal changes in the concentrations of Zn-65; total Zn; Zn-65 activities in water, sediments, plants, and animals; and rate of Zn-65 turnover by various organisms. The area for study was Alder Slough, a small body of water about .6 km upriver from the mouth of the Columbia River. Samples of water, sediments, emergent plants, algae, fish, shrimp, and amphipods were collected for analysis. Zn-65 in water samples was co-precipitated for analysis. Emergent plants and algae were dried, and fish, shrimp, and amphipods were preserved in formalin prior to radioanalysis with an NaI well crystal coupled through a photomultiplier to a multichannel analyzer. Total zinc in plants and animals was determined by atomic absorption. The concentrations and fluctuations of Zn-65 are discussed. (Little-Battelle)

RESPONSE OF CHLORELLA PYRENOIDOSA TO ALUMINUM AND LOW PH, Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div. For primary bibliographic entry see Field 05C. W73-06235

NITROGEN METABOLISM OF AQUATIC OR-GANISMS. II. THE ASSIMILATION OF NITRATE, NITRITE, AND AMMONIA BY BID-DULPHIA AURITA, Lamont-Doherty Geological Observatory, Palisades, N.Y. For primary bibliographic entry see Field 05C. W73-06286

THE UPTAKE OF UREA BY MARINE PHYTOPLANKTON, California Univ., San Diogo, La Jolia. Inst. of Marine Resources.

J. J. McCRTHY.

Journal of Phycology, Vol 8, No 3, p 216-222, September 1972. 7 fig, 2 tab, 28 ref.

Descriptors: "Path of pollutants, "Absorption, "Ureas, "Marine algae, "Phytoplankton, Organic compounds, Diatoms, Chrysophyta, Radioactivity techniques, Nitrites, Assay, Cultures. Identifiers: "Substrate utilization, Lauderia, N-15, Culture media, Enrichment, Cyclotella nana, Ditylum brightwellii, Skeletonema costatum, Stephanopyxis turris, Thalassiosira fluviatilis, Thalassiosira fluviatilis.

Half-saturation constants for urea uptake by 4 clones of neritic diatoms capable of utilizing urea were determined from short-term uptake studies with N-15-labeled urea. K sub s values obtained were similar to those determined earlier for ammonium, and since ammonium and urea concentrations are similar in the marine environment, it was concluded that these species are capable of utilizing ecologically significant concentrations of urea. Two of 3 species unable to grow on urea showed patterns of short-term uptake not unlike those of species capable of utilizing urea, which implies that their assimilatory rather than uptake proceases are defective with regard to urea utilization. The third species initially took N-15 (supplied as urea) into the cells but subsequently released it back into the medium. (Holoman-Battelle) W73-06288

INSTRUMENTATION FOR A RADIOECOLOGI-CAL STUDY OF THE HUMBOLDT BAY MARINE ENVIRONMENT, California Univ., Livermore. Lawrence Livermore Lab. G. Holladay, P. L. Phelps, R. E. Heft, and F. L. Harrison. Report No. UCRL-73416, (CONF-711111-22), November 16, 1971. 11 p. 7 fig. 4 ref.

Descriptors: *Adsorption, *Research equipment, *Radioactive wastes, 'Path of pollutants, Water analysis, Water temperature, Hydrogen ion concentration, Dissolved oxygen, Conductivity, Instrumentation, Sampling, Pumps, Equipment, Clams, Oysters, Trace elements, Heavy metals, Radiation, Radioisotopes, Sediments, Analytical techniques, *Mathematical models, Food chains, Metals, Invertebrates. Identifiers: Bioaccumulation, Transport, *Hum-

boldt Bay, Macroinvertebrates

The Bio-Medical Division of the Lawrence Livermore Laboratory, in cooperation with the Pacific Gas and Electric Company (PGandE), and Humboldt State College, is conducting a radioecological study of Humboldt Bay. The purpose is to develop a mathematical model which describes the passage of individual radionuclides through the marine ecosystem and to test model predictions against field data. The proposed model divides a given marine site into geographical pools, and then each pool is subdivided into compartments, such as aqueous solution, suspended sediment, bottom sediment, specific biota. If the exchange coefficients between all pools and compartments can be determined for a radionuclide, its concentration in any compartment as a function of time can be predicted for any given release into the system. The impact to man of the release can then be estimated if uptake rates are known for any exposed marine life which is in the human food chain. Field sampling operations are described, including methods and equipment for collecting water, core, and bottom samples, uptake studies, and instrumentation for determining conductivity, solar illuminance, temperature, and radiation. The collected samples are to be analyzed for trace elements, iodine, iodates, tritium, pH, and dissolved oxygen. (Little-Battelle)

PHOTOCHEMISTRY OF BIOACTIVE COM-POUNDS. PHOTOLYSIS OF M- (N,N--DIMETHYLFORMAMIDINE) PHENYL N-

Group 5B-Sources of Pollution

METHYLCARBAMATE HYDROCHLORIDE IN

WATER, Michigan State Univ., East Lansing. Pesticide Research Center.

Research Center.
G. C. C. Su, and M. J. Zabik.
Journal of Agricultural and Food Chemistry, Vol.
20, No. 3, p 642-644, May-June 1972. 1 fig, 12 ref.

Descriptors: Water analysis, "Pollutant identifica-tion, Chemical analysis, Miticides, Carbamate pesticides, Degradation (Decomposition), Mass spectrometry, Phenolic pesticides. Identifiers: "Photochemistry, "Photolysis, "m- (N N-Dimethylformamidine) Phenyl N-methylcarba-mate Hydrochloride, Red Cedar River, Thin layer mate Hydrochloride, Red Cedar River, Thm layer chromatography, Infrared spectroscopy, m-For-mamidophenol, Mass spectra, Metabolites, a-Aminophenyl, N-methylcarbamate, m-For-mamidophenyl N-methylcarbamate, m-Hydrox-yphenyl N-methylcarbamate.

The photolysis (gamma greater than 286 nanometers) of m-(N,N-dimethylformamidineopheayl N-methylcarbamate hydrochloride (I) was carried out in water at pH 3.1 and 7.1 at a concentration of 250 ppm. The photoproducts, after they were isolated and purified by two-dimensional thin-layer chromatography, were identified as m-formamidophenyl (VI) (60 percent), m-aminophenyl N-methylcarbamate (II) (10 percent), and m-hydroxyphenyl N-methylcarbamate (III) (10 percent), spectra with their respective authentic samples. (Byrd-Battelle) W73-06298

VOLATILITY OF DDT AND RELATED COM-

POUNDS,
Agricultural Research Service, Riverside, Calif.
Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 05A.
W73-06299

FRUIT-, VEGETABLE-, AND GRA-PROCESSING WASTES, CH2M/Hill, Corvallis, Oreg. For primary bibliographic entry see Field 05F. W73-06302 GRAIN-

ANOXIC WATER IN THE PETTAQUAMSCUTT

RIVER, Rhode Island Univ., Kingston. Graduate School of

Oceanography.
A. G. Gaines, Jr., and M. E. Q. Pilson.
Limnology and Oceanography, Vol. 17, No. 1, p
42-49, January 1972. 5 fig, 3 tab, 16 ref.

Descriptors: *Anaerobic conditions, *Alkalinity, *Water analysis, Environmental effects, Oxygen agg, Rhode Island, Chemical analysis, Brackish water, Water chemistry, River basins, Carbon dioxide, Physiocochemical properties, Volumetric analysis, Pollutant identification, Dissolved oxygen, Phosphates, Salinity, Ammonia, Alkaline earth metals, Hydrogen sulfide, Magnesium, Calcium, Strontium, Heavy metals.

Identifiers: *Anoxic water, *Pettaquamscuit River, Glass calomel electrodes, Infrared CO2 analyzer.

Water samples were analyzed in order to determine the sources of buffering in the upper anoxic basin of the Pettaquanscult River and some related general chemistry. Alkalinities were determined by measuring the pH at 25 C with a specific ion meter and a combination glass-calomel electrode. Total CO2 was measured with an infrared analyzer and soluble reactive phosphate by a standard method. Sulfide was determined by using both a methylene blue method and an iodometric titration method. Chlorinity was determined by silver nitrate titration after air oxidation of the sulfide and alkaline earth metals were measured using Water samples were analyzed in order to deter-

an EDTA-titration method. It was noted that deep basins in the Pettaquamscutt River (Rhode Island), a narrow estuary, were highly stratified and that biogenic hydrogen sulfide accumulated in bottom water to a relatively high concentration of 4.5 millimoles. It was found that by considering the water as a solution of several alkaline substances and one acid (carbonic acid), both the observed pH and the alkalinity which reached a concentration of 12.66 meq/1 could be explained. Knull and Richards' model of alkalinity in anoxic water was improved by considering ammonia. This study revealed that Richards' model of sulfate reduction by organic matter accurately predicted the concentrations of those major products influencing alkalinity and pH. (Byrd-Battelle)

TREATMENT AND DISPOSAL OF CITRUS FRUIT PROCESSING WASTES, Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif. For primary bibliographic entry see Field 05D. W73-06305

SOLVENT EXTRACTION OF URANIUM (VI) WITH TRIOCTYLPHOSPHINE OXIDE IN THE PRESENCE OF AROMATIC CARBOXLIC ACIDS,
Bulgarian Academy of Sciences, Sofia. Inst. of
General and Inorganic Chemistry.
For primary bibliographic entry see Field 05A.
W73-06307

EXPERIMENTAL INFORMATION ON HEXACHLOROCYCLOHEXANE PENETRATION INTO THE SOIL, (IN RUSSIAN), Institute of General and Municipal Hygiene, Moscow (USSR).

L. A. Kozhinova, T. I. Grigor'eva, and O. I.

Yurasova. Gig Sanit. Vol 36, No 11, p 47-49, 1971. English

summary.
Identifiers: BHC, *Groundwater contamination, Soils, USSR, Water pollution sources, *Hexachlorocyclohexane.

Laboratory and field tests indicated that hexachlorocyclohexane penetrated into fertile soil to the depth of 1 m. Most of it was retained in the upper layer (0-10 cm thick). When hexachlorocyclohexane is used in doses recommended by the Ministry of Agriculture of the USSR there is no danger of groundwater contamination.—Copyright 1972, Biological Abstracts, Inc.

DISPERSAL OF ALGAE AND PROTOZOA VIA THE ALIMENTARY TRACTS OF SELECTED THE ALIMENTARY TRACTS OF SELECTED AQUATIC INSECTS, Union Coll., Cranford, N.J. Dept. of Biology. B. M. Solon, and K. W. Stewart. Braviron Entomol. Vol. 1, No. 3, p. 309-314. 1972. Identifiers: "Path of pollutants, "Aquatic insects, Water pollution sources, "Algae, Alimentary tracts, Dispersal, "Protozoa.

The passage of viable algae and protozoa through digestive tracts of field-collected herbivorous and digestive tracts of field-collected herbivorous and carnivorous aquatic insects was demonstrated. Thirty-two genera of viable algae and protozoa were identified from 36 cultures inoculated with aquatic Hydrophilidae hindguts; 86% of the beetle cultures yielded organisms. Nineteen genera of algae and protozoa were identified from 107 cultures inoculated with dragonfly feces; 65% of the dragonfly cultures yielded organisms. The results indicated that herbivorous aquatic beetles were more important than carnivorous dragonflies in dispersal of algae and protozoa by passive internal transport. The results were ecologically significant since aquatic insects periodically disperse, carrying a variety of aquatic microorganisms adapted for alimentary survival during overland transport. Not only was internal transport of spores, cysts, and resistant structures possible, but transport of vegetative algal cells also was demonstrated.—Copyright 1972, Biological Abstracts, Inc. W73-06337

AN ECOLOGICAL STUDY OF SALMONELLA (IN JAPANESE), Azabu Veterinary Coil., Sagamihara (Japan). Dept. of Cattle Microbiology. I. Goto.

Dept. of Cattle Microbiology.

I. Goto.

Jap J Public Health. Vol 19, No 1, p 33-42. 1972.

Identifiers: "Water pollution sources, Ecology, Humans, Pig, "Salmonells, Salmonella anatum, Salmonella braenderup, Salmonella derby, Salmonella enteritidis, Salmonella fischerkietz, Salmonella minnesota, Salmonella montevideo, Salmonella paratyphi, Salmonella schwarzengrund, Salmonella thompson, Salmonella typhimurium, Salmonella vejle.

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In an ecological study, Salmonella were isolated from pigs, pigsties, rivers and humans. The following species were found: S. paratyphi B, S. derby, S. typhimurium, S. Schwarzengrun, S. braendeup, S. montevideo, S. thompson, S. infantis, S. enteritidis, S. vejle, S. anatum, S. meleagridis, S. fischerkietz and S. minnesota.—Copyright 1972, Biological Abstracts, Inc. W73-06342

CHARACTERISTICS OF EFFLUENTS IN TEN SOUTH-EASTERN POULTRY PROCESSING

Richard B. Russell Agricultural Research Center, Athens, Ga. D. Hamm.

D. Hamm.

Poult Sci. Vol 51, No 3, p 825-829, 1972.

Identifiers: "Water pollution sources, "Food processing industry, Effluents, Parameters, Processing plants, Water pollution, Poultry, Southeast U.S.

Ten poultry processing plants were sampled at 7 inplant locations: outflows from the scalder, chiller, giblet chiller, eviscerating trough, final bird washer, feather and viscera flumes. Several pollution indicating parameters were measured. Great variability was noted in these values, not only among plants, but also among samples taken at different times from the same location. The highest COD (chemical oxygen demand) value obtained was 5394 mg 02/1 from the scalder. The medium for the scalder was 2268 mg 02/1 followed medium for the scalder was 2268 mg 02/1 followed closely by a median value of 1919 for all waste water coming from the killing defeathering area. The waste water from the killing defeathering complex had a COD of almost twice that of the eviscerating chilling complex (1919:1005). Improved techniques and equipment for killing, scalding, and defeathering should prove beneficial in reducing pollution from poultry processing plants.—Copyright 1972, Biological Abstracts, Inc. W73-06343

DESCRIPTION OF THE HYDRODYNAMICAL-NUMERICAL MODEL, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 02L. W73-06355

APPENDICES TO A DESCRIPTION OF THE EPRF HYDRODYNAMICAL-NUMERICAL

RPRF HYDRODYNAMICAL-NUMERIA MODEL. Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 02L. W73-06356

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

INFLUENCE OF TEMPERATURE ON THE BIOSYNTHESIS OF IRON TRANSPORT COM-POUNDS BY SALMONELLA TYPHIMURIUM, Western Regional Research Lab., Berkeley, Calif. For primary bibliographic entry see Field 65C.

ON FLOW IN ESTUARIES, Technical Univ. of Denmark, Copenhagen. For primary bibliographic entry see Field 02L.

MEASUREMENTS ON HORIZONTAL BUOYANT JET IN CALM AMBIENT FLUID, WITH THEORY BASED ON VARIABLE COEF-FICIENT OF ENTRAINMENT DETERMINED EXPERIMENTALLY, Hydraulics Research Station, Wallingford, (En-For primar W73-06369 imary bibliographic entry see Field 08B.

LAYERS OF HIGH THERMAL CONDUCTIVI-TY IN THE NORTH ATLANTIC,
Massachusetts Inst. of Tech., Cambridge. Dept. of
Earth and Planetary Sciences.
For primary bibliographic entry see Field 02G.
W73-06377

THE USE OF A SIMPLE MATHEMATICAL MODEL TO ACCOUNT FOR THE VARIATION OF COLIFORM DENSITY, SALINITY AND TEMPERATURE WITH TIDAL STATE, Dundee Univ. (Scotland). Dept. of Civil Engineer-

ing.
J. R. West, and D. J. A. Williams.
In: Advances in Water Pollution Research,
Proceedings of the Fifth International Conference,
San Francisco, 1970, Pergamon Press Ltd., 1971. 6
p, 4 fig, 3 tab, 8 ref.

Descriptors: *Estuary, *Temperature, *Salinity, *E. coli, *Mathematical models, Heated water, Model studies, Path of pollutants, Water pollution

Identifiers: Sinusoidal models, Tidal cycle, Vari-ance, *Tay Estuary (UK).

Previous work on pollution and the viability of E. coli in marine waters has been complicated by the complexity of hydraulic characteristics of the sam-pling point and the problems of data analysis. Salinity, bacterial numbers and temperature throughout a tidal cycle were represented at a throughout a tidal cycle were represented at a point and salinity and water temperature data were fitted to the model. The sampling point is located at Newport in the Tay Estuary. Salinity and temas reswport in the Tay Estuary. Salinity and tem-perature were me. sured with a salinity/tempera-ture bridge developed by National Institute of Oceanography, England. The results for salinity and temperature indicate a good fit with the model. Values of the constant indicated a high degree of mixing, MPN of E. coli show maxima near to low water and minima near to high water. (Upadhyaya -Vanderbilt) W73.06379 W73-06379

THERMAL INSTABILITIES IN TWO-FLUID HORIZONTAL LAYERS, Michigan State Univ., East Lansing. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 08B. W73-06380

PARAMETERS NECESSARY FOR ANALYZING THERMAL BIOASSAYS ON MARINE FISH, For primary bibliographic entry see Field 05C. For primary W73-06382

QUANTIFICATION OF THE EFFECTS OF RATE OF TEMPERATURE CHANGE ON AQUATIC BIOTA, Army Engineer District, Buffalo, N.Y. For primary bibliographic entry see Field 05C. W73-06384

THE QUALITATIVE AND QUANTITATIVE ANALYSIS OF URBAN RUNOFF FOR THE AREA OF THE MEMORIAL SCHOOL RED MAPLE SWAMP IN SPRINGFIELD, MASSACHUSETTS,

ASSACHUSETTS,

ASSACHUSETTS,

ASSACHUSETTS,

ASSACHUSETTS,

ASSACHUSETTS, Univ., Massachusetts Amherst. Graduate Research Center.
For primary bibliographic entry see Field 04C.
W73-06387

CHARACTERIZATION OF GELBSTOFFE IN MONTEREY BAY BY NYLON ADSORPTION, UV, AND PAPER CHROMATOGRAPHY, Naval Postgraduate School, Monterey, Calif. L. W. Lewis, Jr. Available from NTIS, Springfield, Va 22151 AD-745 172; Price \$3.00 printed copy; 95 cents microfiche. M Sc Thesis, March 1972. 95 p, 48 fig, 5 tab, 36 ref.

Descriptors: Water pollution sources, *Organic matter, *Bays, *California, Pacific Ocean, Coasts, Chemical analysis, Wastes, Sewage, Sewage ef-fluents, Chromatography, Phenols, Humic acids, Organic acids, Amino acids, Industrial wastes, Pollutant identification.

Identifiers: *Monterey Bay (Calif), *Dissolved organics, *Gelbstoffe, Ultraviolet spectra.

Dissolved organic components of marine waters Dissolved organic components of marine waters were studied using an inverse-flow glass filter system to separate the particulate and dissolved constituents. Cell rupture was prevented by the use of a gentle positive hydraulic head. Concentrations of humic acids were obtained by a nylon adsorption column which also desalted the sample. The process provided concentrations up to 10,000 times. Paper chromatography and ultra-violet processoric were used to chearcetize the disspectrometry were used to characterize the dis-solved humic content of water from Monterey Bay, California, and offshore ocean stations. The correlations between sources indicated the relative correlations between sources indicated the retained importance of organic acids, amino acids, phenols, and carbohydrates in sewage outfalls, kelpbeds, harbor areas, river mouths, rip currents and industrial discharges. (Woodard-USGS) W73-05388

WATER POLLUTION: SOUTH PLATTE RIVER, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05G. W73.06391

EFFECTS OF WEATHERING ON ORGANIC MATTER IN SHALES, Atlantic Richfield Co., Dallas, Tex. For primary bibliographic entry see Field 02J. W73-06402

CALCULATION OF IONIC ACTIVITIES IN NATURAL WATERS,
Agricultural Univ., Wageningen (Netherlands).
Dept. of Soil Science and Geology.
For primary bibliographic entry see Field 02K.

MIGRATION OF TRACE METALS IN SNOW, Geological Survey of Canada, Ottawa (Ontario). I. R. Jonasson. e, Vol 241, No 5390, p 447-448, February 16, 1973. 3 tab. 7 ref.

Descriptors: *Trace elements, *Mercury, *Snow, Path of pollutants, Water chemistry, Geochemistry, Canada, Snow removal, Deicers.

Various mechanisms by which metals may be trapped in snow were tested by taking samples in three types of environment-urban, unmineralized rural, and mineralized rural. Snows were sampled in the city of Ottawa and in the vicinity of a mercury prospect near Clyde Forks in Eastern Ontario. In January 1971, fresh fallen snow samples col-In January 1971, treas fauten snow samples con-lected in Ottawa contained 3.5 to 4.0 ppb Hg with a mean of 3.7 ppb. The snow contained scattered soot particles, probably residues of burned fuel oil and gasoline. The elevated Hg values probably reflect the Hg content of fossil fuels. The prime inreflect the hig content or rosult tuess. The prime in-fluence on these metal contents is the proximity of a freeway. Elevated contents of Na, Zn, Pb, Ni, and Fe in nearby fallen snow clearly show that falling snow is an efficient scavenger of airborne dust and aerosols. The metal contents of fresh sur-face snow in unmineralized areas are much less than in Ottawa. However, snow collected in mineralized zones contains significant Hg, Pb, Zn, Cu and Mn, particularly near to the soils. Metals readily migrate into the snow from underlying mineralized soils. Significant concentration idients are observed for the ore metals, Hg and gradients are observed for the ore metals, Hg and Cu, where 40- to 50-fold differences in metal content are observed across a 5-foot depth of snow. (Knapp-USGS)
W73-06404

MERCURY IN LAKE SEDIMENTS: A POSSI-BLE INDICATOR OF TECHNOLOGICAL

Imperial Coll. of Science and Technology, London (England). Applied Geochemistry Research

S. R. Aston, D. Bruty, R. Chester, and R. C. Padgham.

Nature, Vol 241, No 5390, p 450-451, February 16, 1973. 1 tab, 9 ref.

Descriptors: *Mercury, *Bottom sediments, *Lakes, Path of pollutants, Trace elements, Sedimentation rates. Identifiers: *Lake Windermere (England).

Lake sediments, which geologically have a relatively rapid rate of deposition, should produce evidence of man's input of Hg to the environ The sediments were sampled from an English lake in a predominantly rural area. A 1-m undisturbed sediment core was obtained from the South basin, Lake Windermere, England. The vertical distribu-tion of Hg could result from an increasing supply of Hg over the past half millenium, probably du to an enhanced release of Hg by man's activitie 's activities. These include: denudation of land surfaces; heavy industry, mining and quarrying; burning of fossil fuels; and sewage disposal. Since 1400 AD there has been a stepwise increase in Hg contents of the sediments which may correlate with man's activi-ties, for example the change at 1800-1870 may reflect the onset of the Industrial Revolution. The combination of various factors comprising technological growth has resulted in a progressive increase of Hg in the sediments. (Knapp-USGS) W73-06-05

THE AQUATIC ECOLOGY OF TOMS RUN, CLARION COUNTY, PENNSYLVANIA PRECEDING WATERSHED RECLAMATION, Clarion State Coll., Pa. Dept. of Biological Science.
For primary bibliographic entry see Field 05G. W73-06472

Group 5C-Effects of Pollution

5C. Effects of Pollution

CADMIUM-INDUCED TESTICULAR INJURY AND ALTERATIONS OF ANDROGEN SYNTHE-SIS IN BROOK TROUT, Fisheries Research Board of Canada, Halifax (Nova Scotai). Halifax Lab.

G. B. Sangalang, and M. J. O'Halloran.
Nature, Vol 240, No 5382, p 460-461, December 22, 1972. 3 fig, 12 ref.

Descriptors: "Cadmium, "Brook trout, "Fish pathology, Fish, Water pollution effects, Toxicity, Animal physiology, Biochemistry, Reproduction, Laboratory tests, Metals, Lethal limit. Identifiers: "Hormones, "Sub-lethal effects.

In fish exposed to 25 ppb cadmium for 24 hours, testes were abnormally vascularized and discolored. The LD (50) for brook trout exposed to discolored. The LD (30) for brook trout exposed to 10 ppm Cd in a freshwater continuous flow system was found to be 21 days. In neither group was there damage to the primordial germ cells. In the damaged testes, a reduction of lipid material indicated that androgen production might have been disturbed. Tissue from the damaged testes produced less 11-hydroxytestosterone and testosterone when incubated with radio-labelled pregnenolone than did control fish tissue. Biosynthesized labelled 11 ketotestosterone was detectable in the control but not in the Cd-damaged tissue incubate. Analysis of normal testicular tissue incubated with varying amounts of cadmium showed that Cd inhibited the conversion of exogenous pregnenolone to free steroids. sion of exogenous pregnenolone to free steroids. Cadmium inhibited the biosynthesis of 11 KT from Cammum miniotice due of synthesis of it K. I from preganeolone. In 1000 ug Cd/g incubated tissue there was a general reduction in product yields of II KT, II OHT and T. Apparently non-lethal levels of pollutants have adverse effects on the reproductive physiology of fish. (Eagle-Vanderbill) W73-05853

GROWTH OF CHLAMYDOMONAS IN A MEDI-UM CONTAINING MERCURY, Hebrew Univ., Jerusalem (Israel). Dept. of Medi-

cal Ecology.

D. Ben-Bassat, G. Shelef, N. Gruner, and H. I.

Nature, Vol 240, No 5375, p 43-44, November 3, 1972. 3 fig. 5 ref.

Descriptors: *Mercury, *Algae, *Chlamydomonas, *Growth rates, *Biochemistry, Growth stages, Volatility, Absorption, Radioac-*Algae, *Chla-*Biochemistry, tive isotopes. Identifiers: Growth lag.

A pure culture of Chalmydomonas reinhardi y (-1) was grown on a sterile medium containing acetate, citrate, and minerals. Mercury at various concentrations was provided as HgCl2 or Hg (203)cl2. Both compounds caused similar effects; at mercury concentrations up to 1.0 mg/1, an increasing lagperiod occurred, but cells were able to recover from the growth lag. Growth in cultures containing 2 mg/1 mercury was completely retarded. The mercury concentration in a control of medium with no cells decreased by 5%. In the whole culture it decreased by 40% over the same 8 dayperiod. The cells contained 2-2.5% of the total culture radioactivity. The amount of mercury per cell decreased by 90% from the 2nd to the 8th day. In the same period the total mercury of the culture decreased by 30%. Most of the loss of mercury is a direct outcome of the presence of algae in the direct outcome of the presence of algae in the medium and the process was particularly active during the lag period. This phenomenon may be due to a biological process causing a change in the mercury to a form which is volatile and less permeable or has less affinity to the cells. (Eagle-Vanderbilt)

POPULATION DIFFERENTIATION IN MARCHANTIA POLYMORPHA L. IN VARIOUS LEAD POLLUTION LEVELS, Glasgow Univ. (Scotland). Dept. of Botamy. For primary bibliographic entry see Field 05B. W73-03857.

THE TOXICITIES OF MERCURY AND ITS COMPOUNDS, Nebraska Univ., Omaha. Coll of Medicine.

A. R. McIntyre.

Journal of Clinical Pharmacology, p 397-401,
November-December 1971. 24 ref.

Descriptors: *Mercury, *Human pathology, Absorption, Toxicity, Lethal limit, Human diseases, Trace elements, Path of pollutants, Solubility,

Identifiers: *Pharmacology, *Clinical pharmacology, Therapeutics, Mercury vapor.

gy, Therapeutics, Mercury vapor.

The toxicity of mercury is divided into four categories. The first, contact with metallic mercury as had been administered in large doses for therapeutic purposes, was a dangerous exposure. Any delay in elimination from the organism might result in formation and absorption of water-soluble mercury salts. Discussed next are the effects of poisoning with mercuric salts, lethal until recently when new treatment methods were introduced. Third, the effects of exposure to an atmosphere polluted with mercury vapor are more complex, insidious in onset, and not fully understood. It is believed that the toxicity of vapors is due to oxidation of mercury when brought in contact with the bronch. Fourth is the very high toxicity of a number of organic mercurial compounds in common use today. Selective action on nervous tissue renders the short chain alkyl heavy metal compounds extremely toxic. (Oleszkiewicz-Vanderbill) W73-05858 W73-05858

MERCURY: ANATOMY OF A POLLUTION PROBLEM, bibliographic entry see Field 05B.

STUDIES ON HUMAN EXPOSED TO METHYL MERCURY THROUGH FISH CONSUMPTION, Kungliga Karolinska Mediko-Kirurgiska Institutet, Stockholm (Sweden). King Gustaf V Research

Inst. G. Birke, A. G. Johnels, L. O. Plantin, B. Sjostrand, and S. Skerfving. Archives of Environmental Health, Vol 25, p 77-91, August 1972. 8 fig. 2 tab, 57 ref.

Descriptors: *Mercury, *Human pathology, *Toxicity, *Human diseases, Heavy metals, Metals, Foods, Fish, Toxins, Laboratory tests, Food chains, Path of pollutants, Distribution patterns, Environmental effects, Water pollution, Analytical techniques.

Identifiers: *Organomercurials, *Methylmercury, Poisoning, Mercury pollution, Clinical studies, Blood, Biological half-life, Body burden.

Human subjects exposed to methyl mercury through consumption of fish were studied during and after varying degrees of exposure. Methyl mercury made up half or less of the blood cell total mercury in 'normal' subjects. The proportion was higher in heavily exposed subjects. The proportion was higher in heavily exposed subjects there was a relationship between exposure to methyl mercury by ingestion of fish and blood mercury levels, and between mercury levels in blood and hair. No symptions and signs indicating methyl mercury poisoning were observed in subjects exposed at most to 0.8 mg of mercury as methyl mercury per day and having mercury levels of up to 1,200 ng/gm blood cells and 185,000 ng/gm hair. After the end of exposure, biologic half-life of mercury as 33 to 120 days in hair and 99 to 120 days in blood cells in five and two subjects, respectively. (Oleszkiewicz-Vanderbilt)

W73-05860

DETERMINATION OF METHYLMERCURY COMPOUNDS IN FOODSTUFFS, I. METHYLMERCURY COMPOUNDS IN FISH, IDENTIFICATION AND DETERMINATION, National Institute of Public Health, Stockholm (Sweden). Dept. of Food Hygiene. For primary bibliographic entry see Field 05A. W73-05864

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FACTORS INFLUENCING THE IN VITRO UP-TAKE OF MERCURY VAPOUR IN BLOOD, Aarbus Univ., (Denmark). Inst. of Pharmacology. For primary bibliographic entry see Field 05B. W73-05867

MERCURY PROBLEM FOR ALBERTA'S GAME BIRDS,

Science Affairs, Montreal, Vol 4, No 3, p 50-52, September 1970. 4 photos.

Descriptors: "Mercury, "Seed treatment, "Seeds, "Game birds, "Canada, Bird eggs, Seeds, Metals, Heavy metals, Toxicity, Trace elements, Pesticides, Metal organic pesticides, Toxins, Testing, Animal metabolism, Food chains, Food pyramids. Identifiers: "Mercury pollution, Alberta, Birds of prey, Pheasants, Hungarian partridge.

prey, Pheasants, Hungarian partridge.

Preliminary investigations in Canada revealed that chlor-alkali industries using mercury cells and industries using mercury for alime control in Ontario and Quebec accounted for at least 75 percent of all mercury used in Canada. Also, considerable amounts of organic mercury were used in Canada as seed treatment. Later studies indicated that mercury was being significantly concentrated in prairie seed-eating birds and rodents, and was being transferred to birds of prey. Additional data showed that meat of Hungarian partridges and pheasants had average mercury levels of 0.24 - 0.79 ppm. Results of a recent survey in Alberta indicate that mercury levels in 1 out of 24 fall collected birds exceeded 0.1 ppm and in another case, 3 out of 43 birds were above 0.1 ppm. In another survey less than 10% of the fall samples were at or above the 0.1 ppm acceptable level compared to 10% above 0.1 ppm level in tissues of the early summer samples. (Oleszkiewicz-Vanderbilt)

TERATOGENIC EFFECTS OF A CHELATING AGENT AND THEIR PREVENTION BY ZINC, California Univ., Davis. Dept. of Nutrition. H. Swenerton, and L. S. Hurley. Science, Vol 173, p 62-64, July 2, 1971. 1 fig, 2 tab, 16 ref.

Descriptors: "Zinc, "Heavy metals, "Laboratory tests, "Animal pathology, Reproduction, Chela-tion, Analytical techniques, Sampling, Testing, Foods, Lethal limits, Toxins, Laboratory animals, Path of pollutants.

Ingestion of a chelating agent (ethylenediaminetetraacetic acid) by female rats during pregnancy impaired reproduction and resulted in congenitally malformed young. When ethylenediaminetetraacetic acid was fed from days 6 to 21 of gestation, all of the full-term young had gross congenital malformations. These effects were prevented by simultaneous supplementation with 1000 parts per million of dietary zinc. (Oleszkiewicz-Vanderbilt)

CONTENTS AND BEHAVIOUR OF MERCURY AS COMPARED WITH OTHER HEAVY METALS IN SEDIMENTS FROM THE RIVERS HINE AND EMS, Institute for Soil Fertility, Haren-Groningen (Netherlands).

For primary bibliographic entry see Field 05B. W73-05887

STUDIES ON THE BIOTRANSFORMATION OF 263 HG-LABELED METHYL MERCURY CHLORIDE IN RATS, Rochester Univ., N.Y. School of Medicine and Deatistry.

T. Norseth, and T. W. Clarkson.
Archives of Environmental Health, Vol 21, p 717-727, December 1970. 8 fig. 5 tab, 18 ref.

Descriptors: "Laboratory animals, "Mercury, "Animal metabolism, Toxicity, Lethal limit, Metals, Heavy metals, Animal pathology, Laboratory tests, Analytical techniques, Sampling, Testing, Pollutant identification, Trace elements,

Identifiers: *Biotransformations, Methyl mercury,

Biotransformation of organic mercury in the rat was followed by specific determination of inorganic mercury after exposure. Inorganic mercury was detected in plasma, brain, and tissues involved in excretion. Inorganic mercury released from the organomercurial redistributes in the body to conform to the pattern of organ distribution of injected mercuric salts. Biotransformation is important in the excretion of mercury after exposure to methyl mercury salts. Inorganic mercury was preferentially excreted in the feces. The delay in the appearance of central nervous sytem disturbances following exposure to methyl mercury compounds could not be explained by accumulation of inorganic mercury in the tissue. That the unique toxic effects of exposure to methyl mercury salts are caused by the intact mercurial is supported. (Oleszkiewicz-Vanderbilt)

ROLE OF CADMIUM IN HUMAN AND EX-PERIMENTAL HYPERTENSION, Pennsylvania Univ., Philadelphia. G. S. Thind.

Journal of the Air Pollution Control Association, Vol 22, No 4, p 267-270, April 1972. 5 fig, 6 ref.

Descriptors: *Cadmium, *Human pathology, *Human diseases, Foods, Metals, Heavy metals, Water pollution, Air pollution, Public health, Laboratory tests, Laboratory animals, Environmental effects. Laboratory animals, Environmental effects. *Hypertension, Clinical studies, Blood.

Blood.

Acute and chronic studies performed in normal rabbits, dogs, human control subjects, and patients with hypertension are reviewed. Cadmium, a common contaminant of air, water, and food, produces persistent hypertension in the rabbit and dog. The metal is predominantly deposited in the kindrey and liver, and to a lesser extent in the blood vessels of the cadmium-hypertensive rabbits. Vascular responsiveness to angiotensin in the cadmium-hypertensive or actic strips was significantly lower than that of the strips obtained from control normotensive rabbits. Administration of cadmium acetate directly into the renal artery, preceding the injection of the vasopressor (angiotensin, epinephrine or norepinephrine), resulted in a doserelated reversible inhibition of the vasopressor-induced renal vasoconstriction. Mean plasma cadmium levels were significantly higher in patients with hypertension. Plasma zinc levels, however, were significantly lower only in hypertensive patients with renovascular and renal parenchymal disease but not in essential hypertension patients. (Olesz-kiewicz-Vanderbilt) kiewicz-Vanderbilt) W73-05893

A SURVEY OF THE MERCURY POLLUTION PROBLEM IN SWEDEN WITH SPECIAL REFERENCE TO FISH, Hawsfiskelaboratoriet, Lysekil (Sweden). For primary bibliographic entry see Field 05B.

W73-05897

METABOLISM OF METHYL MERCU (HG203) COMPOUNDS IN MAN, Kungliga Veterinarhogskolan, Stockhe (Swedea). Dept. of Clinical Biochemistry. B. Aberg, L. Ekman, R. Falk, U. Greitz, and G. MERCURY Archives Environmental Health, Vol 19, p 478-484, 1969. 6 fig, 1 tab, 19 ref.

Descriptors: *Mercury, *Human pathology, *Distribution, Metabolism, Human diseases, Laboratory tests, Foods, Isotope studies, Path of pollutants, Distribution patterns, Water pollution, Fish, Environmental effects, Toxicity, Analytical techniques.

Identifiers: *Mercury ingestion, Biological half-life, Body burden, Sweden, Body organs, Clinical

The oral intake of 2.5 microcuries of methyl-mer-curic nitrate Hg 203 by three clinically healthy, white male volunteers aged 37 to 44 years resulted in an accumulation in the liver and the head of the in an accumulation in the liver and the head of the Hg 203. The main excretory route was the feces but the urinary excretion increased with time up to 30 days after the intake. The biological half-life was found with whole body measurements to be 70 to 74 days. The decline of Hg 203 in the head was less rapid than in the rest of the body. No Hg 203 was found in the sperm. A very rapid uptake was found in the erythrocyles. The main activity was localized in the liver (about 50% of the contents of the body) whereas the head contained about 10% of the total body content. After infinite time a weekly unit dose of methyl mercuric airtate Hg 203 will result in a whole body burden of 15.2 units mercury. (Oleszkiewicz-Vanderbilt) W73-05898

THE POISON CHAIN FOR MERCURY IN THE

ENVIRONMENT, Middlesex Hospital Medical School, London (England). G. Kazantzis.

International Journal of Environmental Studies, Vol 1, p 301-306, 1971. 18 ref.

Descriptors: *Reviews, *Mercury, *Food chains, *Toxins, *Path of pollutants, Fish, Foods, Human pathology, Animal pathology, Biochemistry, Distribution patterns, Water pollution, Toxicity, Environmental effects.

Identifiers: *Mercury pollution, *Methylation, Organomercurials, Body burden, Poisoning.

The toxic effects of mercury in specific population groups have long been known, but mercury as a general eavironmental hazard has followed comparatively recent technological development. Conparatively recent technological development. Con-tamination with both inorganic mercury and or-ganic mercury compounds has resulted from in-dustrial waste and from the use of the latter com-pounds as fungicides. Deposited eventually in rivers and lakes, this has led to raised levels of mercury in fish. Under appropriate conditions, methylation of mercury may occur in the natural environment, converting less toxic inorganic and aryl mercury compounds into the more toxic alkyl mercury form. In certain predominantly fish eating populations this had led to an increase in the body burden for organic mercury, resulting in localized outbreaks of methyl mercury poisoning. Raised levels of mercury in eggs and bird tissues have resulted from feeding on mercury contaminated fish and on organomercury treated seed. In addifish and on organomercury treated seed. In addition to the direct toxic action of mercury, limited evidence suggests that methyl mercury com-pounds may possibly exert mutagenic and teratogenic effects, at levels below those usually associated with poisoning. (Oleszkiewicz-Van-derbilt)

DETERGENTS IN WATER HYGIENE AND SANITARY PROTECTION OF WATER RESER-VOIRS, (IN RUSSIAN), E. A. Mozhaev, V. P. Osintseva, O. I. Yurasova,

E. A. Mozhaev, V. P. Osintseva, O. I. Yurasova, Yu. V. Lin'kov, and N. N. Litvinov. Vestn Akad Med Nauk SSR. Vol 27, No 1, p 42-47. 1972. English summary. Identifiers: "Detergents, Reservoirs, "USSR, "Water quality, Toxicity, Water quality control.

*Water quality, Toxicity, Water quality control.

Many water reaervoirs contain synthetic detergents. In water bodies of the USSR their concentration does not usually exceed the permissible levels. These substances can adversely affect the organoleptic properties of water and cause excessive foaming. Their toxicity is relatively low, both with an acute and chronic action on rats. However, acting on the organism along with other substances, detergents, even in very low dosages, stimulate the entry of various chemicals from the intestine into the blood, potentiating the toxic effect of the latter during the first days after oral introduction. The possibility of a well-marked potentiating action of substances in the presence of detergents makes it important for the permissible concentration in water supply sources to be lowered. The production and use of biologically mild detergents, effective biological treatment of effluents and control over the quality of water supplied to the population are principal preventive measures.—Copyright 1972, Biological Abstracts, Inc. W73-05900

THE EFFECT OF TREATING SMALL RIVERS OF THE WESTERN POLESYE WITH INSECTICIDES (DURING CONTROL OF BLOOD SUCKING FLIES) ON THEIR HYDROBIOLOGICAL REGIME (IN RUSSIAN), I. V. Grib, V. Z. Kovban, and A. L. Burtsev. Gidrobiol Zh. No 8, No 1, p 98-101. 1972. Illus. Identifiers: "Water pollution effects, Pesticides, "Insect control, Arthropods, DDT, Diatoms, Flies, Hydrobiology, Infusorian, Insecticides, Polesye, Rivers, Rotifers, USSR.

DDT in the form of an emulaion was mixed with river water to a concentration of 0.2 mg/l, which had 94% larvicidal effectiveness. DDT was partially inactivated to the less toxic metabolites DDD and DDE. Their precipitation on the bottom qualitatively and quantitatively altered the species composition of the biosystem, killed rotifers, infusorians and arthropods, increased the number of diatomic algae, altered the ion concentration and distributed the processes of oxidation and photosynthesis. It was concluded that the use of DDT was justified under conditions of threat of a massive invasion of blood sucking flies, and the absence of fish-raising ponds and users along the course of the rivers.—Copyright 1972, Biological Abstracts, Inc.

DANGEROUS PROPERTIES OF INDUSTRIAL

DANGEROUS PROPERTIES OF INDUSTRIAL MATERIALS, New York State Dept. of Health, Albany. Radiological Sciences Lab. N. I. Sax. Van Nostrand Reinhold Company, New York, New York, 3rd edition, 1968. 1251 p.

Descriptors: "Hazards, "Materials, Materials test-ing, Industrial wastes, Chemicals, Chemical pro-perties, "Toxicity, Toxins, Waste disposal, Water pollution, Properties, Radioactivity effects, Solid

Identifiers: *Toxicology, Solid waste disposal,

Increasing amounts of chemicals used in modern industry and a corresponding increase in potential pollution and safety hazards make it imperative that persons in the field of water resources be informed of the dangerous properties of industrial

Group 5C-Effects of Pollution

materials with which they may come in contact. A total of over 12,000 industrial materials are described—giving name, chemistry, toxic and fire hazards, and counter-measures to toxic effects. All aspects of hazard are covered, including radiation hazards, industrial fire protection, storage and handling of hazardous materials, allergic disease in industry, food additives, toxicology, radiological environmental pollution, respiratory protection and personal hygiene and industrial air contaminant control. Of particular interest to people in water resources is Section 4, a new addition to the 3rd edition. In it air and water pollution problems are dealt with, as well as the burgeoning problem of solid waste disposal. (Smith-NWWA)

WATER QUALITY IN A STRESSED ENVIRON-MENT. ary bibliographic entry see Field 05B. For primar W73-05932

HYDRODYNAMIC INTERACTION OF THER-MAL STRATIFICATION AND RESERVOIR WATER QUALITY, Stone and Webster Engineering Corp., Boston, Mass.

Mass.
M. Markofsky.
M. Markofsky.
Meeting Preprint No. 1893, American Society of
Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29February 2, 1973. 29 p, 12 fig, 1 tab, 6 ref.

Descriptors: "Reservoirs, "Water quality, "Stratified flow, "Hydrodynamics, "Thermal stratification, Thermocline, Stratification, Reservoir operation, Currents (Water), Water pollution, Water pollution control, Dissolved oxygen, Thermal properties, Flow, Streamflow, Storage.

Identifiers: "Reservoir water quality, "Stream

The construction of a reservoir on a river usually leads to substantial changes in water quality both within the reservoir and in the river downstream of the reservoir. These changes reflect modifications of the physical, chemical and biological regimes in the reservoir which are associated with the reduction of flow velocity and the physical shape of the reservoir. The thermal structure of the reservoir, with temperature variations and thermal stratifications, has a dominant effect on the water quality. Stratification is especially prevalent in deep reservoirs with the result that vertical currents are inhibited and the outflows are primarily from a woirs with the result that vertical currents are inhibited and the outflows are primarily from a
restricted layer. Actual mixing of the inflow water
in the reservoir depends on a number of factors,
the most important being temperature. Coupled
with the depth of the inflowing water, these factors determine the flow of the water into the reservoir and the flow patterns of the water inside the
reservoir, which determines detention time and
hence water quality. External factors such as solar
radiation, expangration, and seemage through the hence water quality. External factors such as solar radiation, evaporation, and seepage through the reservoir perimeter also have important effects on the flow patterns. These phenomena were investigated by laboratory experiments at the Massachusetts Institute of Technology with dyed inflows into large flumes. Of primary importance is the dissolved oxygen levels of the reservoir, which range from abundant near the surface layer to highly deficient in lower layers. Field tests on Fontana Reservoir showed how seasonal variations affected the turnover of water in the reservoir. (Ponetiner) (Poertner) W73-05936

INVESTIGATION OF THE EFFECTS OF SANITARY LANDFILLS IN COAL STRIP MINES ON GKOUND WATER QUALITY, Martin (A. W.) Associates, King of Prussia, Pa. G. H. Emrich, and R. A. Landon. Penasylvania Department of Environmental Resources, Bureau of Water Quality Management

Publication No. 30, Harrisburg, 1971. 56 p, 22 fig,

Descriptors: "Solids wastes, "Water pollution, "Groundwater resources, "Landfills, "Stripmines, Penasylvania, Leaching, Path of pollutants, Land reclamation, Water pollution control, Water pollution sources, Water management (Applied), Municipal wastes, Disposal, Garbage dumps.
Identifiers: *Refuse disposal, *Solid wastes

With the increasing need for satisfactory sites for solid wastes disposal, the practicality of using abandoned coal strip mines as disposal sites should be carefully investigated. In Pennsylvania, five landfills, four of them in abandoned coal strip mines and one in an area of similar shale terrain, were investigated to determine the effect of landfill leachate on groundwater quality. Test wells were drilled at each site to determine refuse table elevation, groundwater movement direction, and groundwater quality below and adjacent to the landfills. Groundwater quality was generally not affected unless the underlying ground had fissures which allowed the leachate to permeate through to the groundwater. The predominate movement of leachate water was found to be in a horizontal direction at the refuse-bedrock interface. In many extensively developed coal stripmined areas, the substructure (bedrock) has been sufficiently disturbed to allow groundwater pollution; although without this bedrock disturbance groundwater pollution should not be a problem. It is important to know the complete hydrogeologic structure of the coal mined area if it is to be used as a landfill. (Poertner)

CIRCULATION OF POLIOVIRUS OBTAINED DURING A STUDY OF THE SEWAGE OF BAKU AND THEIR VIROLOGICAL CHARAC-TERISTICS (IN RUSSIAN), For primary bibliographic entry see Field 05B. W73-03969

EFFECTS OF COAL MINING ON THE WATER RESOURCES OF THE TRADEWATER RIVER BASIN, KENTUCKY, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W73-05981

SEASONAL CHANGES IN THE MEIOFAUNA POPULATION OF AN INTERTIDAL SAND BEACH,
Marine Biological Association of the United Kingdom, Plymouth (England). Lab.
R. P. Harris.
Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 2, p 389-403, May 1972. 8 fig, 2 tab, 24 ref.

Descriptors: "Intertidal areas, "Seasonal, "Environmental effects, "Variability, Connate water, Animal populations, Invertebrates, Water temperature, Sea water, Depth, Nematodes, Copepods, Sampling. Identifiers: "Population density, Vertical distribution, England, "Whitesand Bay (UK), Random sampling, Hydrozoa, Coelenterates, Turbellaris, Gastrotrichs, Tardigrades, Naupli, Sample preservation, Flatworms, Counting.

A quantitative study was made of seasonal changes in the meiofauna population of an exposed sand beach at Whitsand Bay, Cornwall. Seasonal changes in population density and vertical distribution of the major meiofauna groups are described for a period of 2 years from May 1968 to May 1970. At the most intensively sampled station, at about M.L.W.N., there were distinct

summer peaks in meiofauna numbers. Maximum densities occurred at the time of highest temperatures, and a significant positive correlation between meiofauna numbers and sea-water temperature was demonstrated. Pronounced seasonal changes in depth distribution of the fauna were observed, and the timing and extent of these are described. The fauna was concentrated at the sand surface in the summer months, and migrated down to depths greater than 30 cm in winter. The factors affecting seasonal changes in the meiofauna of the beach are discussed. The seasonal cycle of seawater temperature, by its effect on reproduction, is probably a major factor controlling meiofauna density. The seasonal changes observed at Whitsand Bay are compared with those reported from other European intertidal sand beaches. (Holocana-Battelle) W73-05997

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HOW TO MEASURE THE ILLUMINATION RATE WHEN INVESTIGATING THE RATE OF PHOTOSYNTHESIS OF UNICELLULAR ALGAE UNDER VARIOUS LIGHT CONDI-

Copenhagen Univ. (Denmark). Freshwatet Engliscal Lab.
E. S. Nielsen, and M. Willemoes.
Internationale Revue der Gesamten
Hydrobiologie, Vol 36, No 4, p 541-556, 1971. 10

Descriptors: *Light penetration, *Photosynthesis, *Aquatic algae, Rates, *Methodology, *Measurement, Primary productivity, Laboratory tests, Radioactivity techniques, On-site data collections, Chlorophyta, Cyanophyta, Chrysophyta, Diatome, Carbon radioisotopes. Identifiers: *Illumination, Chlorella pyrenoidosa, Coclosphaerium, Nitzschia palea, Shipboard measurements, C-14, Jeriov-Nygaard light meter.

Coetospnaerium, Nitzschia palea, Shipboard measurements, C-14, Jerlov-Nygaard light meter.

The rate of photosynthesis as a function of the rate of illumination has been investigated by using various light sources and by stating the rate of illumination either in quanta or in energy units for the wavelength range 350-700 nm. Three unicellular algal species were employed, a diatom, Nitzschia palea, a green alga, Chlorella pyrenoidosa and a blue green alga, Coelosphaerium sp. For the diatom and the green alga the curves presenting the rate of photosynthesis as a function of the illumination rate are rather alike in fluorescent (Phillips W 33) and incandescent light. The curves are practically identical for the diatom, if the illumination is measured in energy units and for the green alga if it is measured in quanta. In the blue green alga, on the other hand, a considerable difference occurs depending on the light source. By means of special color filters the light in the lower part of typical ocean water (blue) and in typical coasta water (green) was simulated. The diatom utilized the 'blue ocean' light and green coastal' light almost as efficiently as fluorescent light. The green coastal' light and fluorescent light. Finally the blue green alga utilized the 'blue ocean' light and green coastal' light and fluorescent light. Sight and fluorescent light considerably less than fluorescent light tonsiderably less than fluorescent light. When photosynthesis is to be considered on an ecological basis without going into details it is recommended that illumination rates in quanta (130-700 nm) be determined by the Jerlov-Nygaard light meter. It is especially constructed for use on board research ships when making simulated in situ measurements of primary production. (Holoman-Battelle)

DISTRIBUTION AND MIGRATION OF PERIDINUM IN LAKE KINNERET, Kinneret Limnological Lab., Tiberias (Israel). T. Berman, and W. Rodhe. Internationale Vereinigung fur Theoretische und Angewandte Limnologie, Mitteilungen, No 19, p 266-276, November 1971.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05 Effects of Pollution—Group 5C

Descriptors: "Dinoflagellates, "Pyrrophyta, Protozoa, "Phytoplankton, "Zooplankton, Ecological distribution, "Diurnal distribution, Biomass, Fluorometry, On-site investigations, On-site data collections, Water quality, Vertical migration, Eutrophication, Water pollution effects, Water pollution sources, Aquatic algae, Aquatic animals, Lakes, Freshwater, Distribution patterns, Chlorophyll, Assay, Secchi disks, Nuisance algae, Color

Lakes, Presument, Chlorophyll, Assay, Secchi disks, Nuisance algae, Color.
Identifiers: *Lake Kinneret, *Peridinium westii, Turbidometry, Vertical distribution, Biometry, Chlorophyll a, Pheophytin, Lake Tiberias, Peridinium cinctum f. westii, Diplopsalis.

Peridinium cinctum f. westii, Diplopsalis.

In the phytoplankton of Lake Kinneret (Lake Tiberias) seven species of Peridinium and one of the closely related genus, Diplopsalis, have been recorded. By far the most important of these is Peridinium westii (P. cinctum f. westii) which fluorishes from about January to June. The spring bloom of this dinoflagellate often reaches dramatic proportions discoloring the lake and constituting a nuisance to water users. The bloom has important economic implications in view of the intensive use of Lake Kinneret for fishery, recreation and, above all, as the main reservoir for Israel's National Water Carrier. Peridinium cells are very motile and their migrations, combined with watermass movements, lead to dynamically changing dispersions. Nevertheless some consistent fearners, which may be intrinsic to the pattern of the Peridinium bloom, were observed. Such findings are based on separate field-studies using turbidometry and fluorometry. An Aberg-Rodhe transmission meter (3.3 cm horizontal light beam, blue filter BG 5) was used to calculate in situ extinction coefficients. Chlorophyll a and phaeophytin concentrations were assayed in situ by the technique of Lorenzen with a Turner Model III fluorometer. This instrument was calibrated to yield approximate numbers of Peridinium cells/ml and enabled the recording of continuous depth profiles at fixed stations or horizontal scans on board a moving vessel. (Holoman-Battelle)

DETOXIFICATION OF PHOSDRIN (TRADE NAME) BY 'BACILLUS MEGATHERIUM' EN-ZYMES, Air Force Armament Lab., Eglin AFB, Fla. For primary bibliographic entry see Field 05B. W73-06005

UTILIZATION OF HYDROCARBONS BY MICROORGANISMS, LIPIDS AND PHOSPHOLIPIDS OF CANDIDA LIPOLYTICA GROWN ON HEXADECANE AND ON GLUCOSE MEDIA, National Research Centre, Cairo (Egypt). Biochemistry Dept. For primary bibliographic entry see Field 05B. W73-06007.

METALS AS POLLUTANTS IN AIR AND WATER, Ocean Engineering Information Service, La Jolla, Calif. For primary bibliographic entry see Field 05A. W73-06009

SURVIVAL OF RANA PIPIENS IN DEIONIZED WATER, Veterans Administration Hospital, New Orleans, R. D. McAfee.

Science, Vol 178, No 4057, p 183-185, October 13, 1972. 11 ref.

Descriptors: *Environmental effects, Frogs, Amphibians, Ion transport, Aqueous solutions, Membrane processes, Osmosis, Radioactivity techniques, Chlorides, Tagging, Analytical techniques.

Identifiers: *Rana pipiens, *Osmoregulation, Survival, *Deionized water, Sodium radioisotopes, Ashing, Chordates.

Ashing, Chordates.

The ability of Rana pipiens to survive in deionized water was studied in order to dispell the generally accepted view that frogs die within a few hours if placed in distilled water due to a rapid loss of sodium chloride via their permeable skin and inefficient salt reabsorptive mechanisms (via the kidney) to aqueous environments. A 1936 experiment in which frogs were sprayed with distilled water and survived for more than 3 to 12 weeks at room temperature is cited as an example of how frogs can survive for long periods in deionized water by utilizing their remarkable power to retain salts and their mechanism for absorbing the chloride ion through the skin from dilute solutions of sodium chloride. Ashing experiments indicate that regardless of the prior history of the frog, maintenance for 30 to 60 days in deionized water does not alter the sodium ion content. Isotope experiments seem to indicate that sodium ion outflux in living frogs are at least partial measurements of an exchange reaction rather than of net sodium ion loss; consequently, tracer experiments on living frogs may give the impression that the skin is permeable to sodium ions when it is not. Whatever the reason for the misconception about a frog's ability to survive salt-free water, it is clear that frogs do not lose appreciable amounts of sodium ions to distilled or deionized water and are able to survive for many weeks. (Byrd-Battelle)

NUTRIENTS IN THE PAMLICO RIVER ESTUA-

NUTRIENTS IN THE PAMLICO RIVER ESTUA-RY, N.C., 1969-1971, North Carolina Water Resources Research Inst., Raleigh.
J. E. Hobbie, B. J. Copeland, and W. C. Harrison.
Available from the National Technical Informa-tion Service as PB-216 806; \$3.00 in paper copy, 9.09 in microfiche. Water Resources Research In-stitute of the University of North Carolina, Raleigh, UNC-WRRI Report No. 76, December 1972. 242 p, 82 fig, 3 tab, 35 ref, 4 append. OWRR B-020-NC (2), 14-31-0001-3113.

Descriptors: *Eutrophication, *Trophic levels, *Nutrients, *Nitrogen compounds, *Phosphorus compounds, Hydrography, *North Carolina, Nitrates, Mining, Algae.
Identifiers: *Pamlico River estuary.

This study was initiated in 1966 on Pamlico River Estuary to determine hydrography, phosphorus concentrations in water and sediment, and phytoplankton speciation and biomass in relation to inputs from Tar River Basin and phosphorus mining activities. The study was expanded in 1969 to include investigation of nitrogen concentrations and effects. Phosphorus concentrations are high throughout the Pamlico River Estuary, with main input via Tar River. Since concentrations are already high, additions from smaller tributaries and phosphate mining activities are insignificant in the development of a wintertime algal bloom. Total phosphorus concentrations have been steadily increasing in estuary since the beginning of study in 1966. Inorganic nitrogen concentrations ranged between summer low and winter high. Concentrations controlled to some extent by flow of Tar River. During times of moderate to high rates of inflow there were large build-ups of nitrate in the estuary. Other tributary inputs were small and their total contribution of nitrate insignificant. Dissolved organic nitrogen was most abundant form of nitrogen, but is not thought to be biologically available. Strong algal bloom occurs in the middle reaches of the estuary each winter and correlates very well with nitrate concentrations. Blooms apparently related to movement of high nitrate concentrations into clearer, middle reaches of estuary during late fall and winter. Phytoplankton, nitrate, eductase activity, in the estuary parallaled development of winter dinoflagellate bloom, This study was initiated in 1966 on Pamlico River

nitrate was an important source of nitrogen for bloom organism in spite of abundance of am-monia. W73-06025

THE ECOLOGIC IMPACT OF THE INTERACTIONS AMONG MICROORGANISMS AND AQUATIC CONTAMINANTS IN LAKE ERIE PHASE III, PARTS 5, 6, AND 7, Ohio State Univ., Columbus. Water Resources

R. M. Pfister, P. R. Dugan, J. I. Frea, and C. I.

Randles.

Available from the National Technical Information Service as PB-216 897; \$3.00 in paper copy, \$0.95 in microfiche. Ohio Water Resources Center, Columbus, Completion Report No. 373X, (1973). 172 p. 35 fig. 7 tab, 83 ref. OWRR B-025-OHIO (2). 14-31-0001-3320.

Descriptors: "Microenvironment, "Enzymes, "Actinomycates, "Aquatic bacteria, "Nutrient requirements, "Pesticides, "Cyanophyta, Environmental affects, Seasonal, Amino acides, Aldrin, Dieldrin, Cytological studies, "Lake Erie.

Actinomyces and streptomyces could envelop a substrate particle of chitin, collagen or cellulose. Proteolytic eazymes produced by mycelia were absorbed by a number of mineral particles and retained enzyme activity. Activity of certain proteolytic enzyme systems could be detected in solutions where they had been too dilute to detect by adsorbing them to mineral particles such as kaolinite. The effect of particulate materials on microbial growth was studied. The availability of particulates from Lake Erie as particular nutrients sources, for example, earbon or nitrogen was also particulates from Lake Erie as particular nutrients sources, for example, carbon or aitrogen was also examined. A number of microorganisms from Lake Erie responded in different ways to microparticulates as sources of carbon or nitrogen throughout a year. Experiments were also undertaken to test the affect of aldrin and dieldrin on Anacystis nidulans or Microcystis seruginoss, both examples of blue-green algae. Both of the pesticides appeared to affect the growth of these organisms at the onset of the experiments. With time the cells appeared to recover and examination with the electron microscope did not reveal any significant identifiable ultrastructural changes. (See also W72-06136)

PLANKTON POPULATIONS AND SOME EFFECTS OF MINE DRAINAGE ON PRIMARY PRODUCTIVITY OF THE COEUR D'ALENE RIVER, DELTA, AND LAKE, Idaho Univ., Moscow. Water Resources Research

Inst. F. W. Babe, R. C. Wissmar, and K. F. Winter. Available from the National Technical Information Service as PB-216 811, \$3.00 in paper copy, \$0.95 in microfiche. Research Technical Completion Report, 1973. 20 p, 3 fig, 19 ref. OWRR A-030-IDA (2), 14-01-01-3212.

Descriptors: "Zinc, "Cadmium, "Copper, Toxicity, Water pollution sources, Chrysophyta, Phytoplankton, "Mine wastes, Toxim, Photosynthesis, Aquatic productivity, Aquatic algae, "Primary productivity, Bioassay, Water pollution effects, Acid mine water, Algae. Identifiers: "Coeur D'Alene River (Ida).

Variations in primary production a physiochemical measurements in the Co d'Alene (CDA) River and Lake contaminated a Atene (CDA) River and Lake contaminated by mine and industrial wastes were examined from May, 1969, to November, 1970. Metal concentra-tions Md, Cd, Mg, Ca, Pb, Cu, Zn, Fe, Na, and K; water quality and phytoplankton composition-den-sity were determined for 35 dates during this period. Additional sampling included unpolluted portions od CDA Lake from December, 1969, to November, 1970, and the unaffected St. Joe River

Group 5C-Effects of Pollution

during the summers of 1969-70. Primary production ranged from 17.6 to 1337.9 mg C/m2/day in the CDA River and 69.3 to 1714.5 mg C/m2/day in the CDA Lake. Concentrations of zinc (011 to 11.2 mg Zn/1) and copper (0.0 to 0.6 mg Cu/1) in the CDA River indicated that heavy metals could be toxic to algae. Diatoms dominated phytoplankton in the CDA River, Lake and St. Joe River. Nonnoplankton from CDA Lake were exposed to known concentrations of Cu2+, C24+, Zn2+ and dilutions of CDA River water under controlled light and temperature. Inhibitory effects of separate and interacting metals on carbon-14 uptake by algae were assessed with factorial designed bioassays and response surfaces. Copper, cadmium, and zinc were acutely and synergistically toxic to carbon uptake by phytoplankton. Concentrations ranged from 0.05 to 0.75 mg Cu/l, 0.1 to 0.3 mg Cm/l, and 0.1 to 1.5 mg Zn/l. Copper caused an overriding effect on two- and three-way interactions of Cu2+, Cd2+ and Zn2+. Dilutions of CDA River water decreased Cu and Zn toxicity. Variable algal community structure, major cations, softwater (660 mg/l as CaCO3) and water quality appeared to affect metal toxicity.

PHYSIOLOGY AND NATURAL DISTRIBUTION OF THE BACTERIUM CARYOPHANON LATUM, Missouri Water Resources Research Center, Rol-

IB. J. B. Hufham, R. Carroll, and J. Hill.
Available from the National Technical Information Service as PB-216 602, \$3.00 in paper copy, \$0.95 in microfiche. Missouri Water Resources Research Center, Columbia, Completion Report, November, 1972. 19 p, 4 tab, append. OWRR A-048-MO (1).

Descriptors: Pollutant identification, Water pollution, *Ruminants, Ecology, Physiology, Water analysis, *Bacteria, Microbiology, Water pollution

sources.
Identifiers: *Caryophanon latum, *Fecal pollu-

An experimental selective medium was developed for use in quantitatively analyzing stream waters for the presence of the genus Caryophanon. The medium was based on yeast extract-peptone agar and incorporated high concentrations of streptomycin to inhibit growth of other microorganisms. Physiological studies with the organism. C. latum, showed a requirement which was met by using crude agar or an extract of crude agar. Resistance to suffer the need to identify. to sulfa drugs was also noted. The need to identify the nutrient or cofactor supplied by crude agar prohibits the final development and field trials of the medium.

FEEDING OF DOMESTIC CARP YEARLINGS ON A DIET WITH LYSINE SUPPLEMENTS AND THE PROTEIN COMPOSITION OF THE BLOOD SERUM (IN RUSSIAN),

D. R. Sadykhov.

Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst
Prudovogo Rybn Khoz. 3. p 213-227. 1970. English Identifiers: Blood serum, *Carp yearlings, Diet,

*I.vsine, *Protein.

The effect of additions of synthetic lysine (0.5%, 1.0%, 1.5%) was studied on the effectiveness of the use of N nutrients and the protein composition of the blood serum in carp yearlings in ponds with 10-12-fold stocking. The growth in experimental groups increased an average of 14-18% with simultaneous decrease in food consumptions per kg of growth by 15-21.3% compared to the control. Substantial increases in the contents of general protein, and albumins and the value of the albumin/g coefficient in the blood serum of experimental fish was abown by paper electrophoresis.—Copyright 1972, Biological Abstracts, Inc.

W73-06067

RAPID DETECTION SYSTEM FOR OR-GANOPHOSPHATES AND CARBAMATE IN-SECTICIDES IN WATER. Midwest Research Inst., Kansas City, Mo. Life Services Div. For primary bibliographic entry see Field 05A. W73-06075

PHOSPHATES IN DETERGENTS - BANE OR

BOON, North Carolina Univ., Chapel Hill. Dept. of En-vironmental Sciences and Engineering. D. A. Okun.

Environmental Affairs, Vol 2, No 1, p 64-79, Spring 1972, 29 ref.

Descriptors: *Phosphates, *Eutrophication, *Detergents, *Water quality control, Technology, Waste water treatment.
Identifiers: *Phosphate replacement.

Identifiers: *Phosphate replacement.

Water quality problems attributed to phosphates are examined. Several approaches to the problem are assessed, and the proposal of removing all phosphates from detergents is placed into perspective. Phosphates only become a problem when they contribute to excessive eutrophication. The nationwide concern over phosphates in detergents implies that eutrophication is a national problem. Eutrophication is not a national problem, since 85% of the population of the U.S. cannot be claimed to make any contribution to the eutrophication of natural waters. A return to the habits of the pre-detergent era could not eliminate eutrophication. Three approaches to the problem of eutrophication are suggested: (1) diversion of wastewaters around the lake or estuary, (2) application of wastewaters to the land, and (3) treatment of urban wastewaters. The search for phosphate replacements continues. Such a search is inappropriate since the technology exists to control eutrophication. To introduce an unknown compound on the scale required of a phosphate replacement would be far more dangerous than to recognize that phosphates are a safe, useful product that can be controlled if pollution control becomes a national objective. (Strachan-Chicago) W73-06089

MULTIRESEARCH - PROBLEMS OF INITIATION,
CONTROL, INTEGRATION, AND REWARD,
California Univ., Davis. Dept. of Sociology; and
California Univ., Davis. Div. of Environmental

For primary bibliographic entry see Field 06B. W73-06095

GRAPHIC REPRESENTATION OF NICHE WIDTH AND ITS APPLICATION TO SALT MARSH LITTORAL FORAMINIFERA, City Univ. of New York.

W. A. Muller: Available from the National Technical Informa-tion Service as COO-3254-5, \$3.00 in paper copy, \$0.95 in microfiche. Ph D Dissertation, 1972. 120 p. 35 fig., 10 tab., 104 ref. AEC AT 3995/AT (11-1)3254.

Descriptors: *Biological communities, *Graphical methods, *Niches, *Salt marshes, *Littoral, Temperature, Salinity, Hydrogen ion concentration, Feeding rates, Competition, Bacteria, Oxygen, Width.

Identifiers: *Foraminifera, Allogromia laticollaris, Rosalina leei, Spiroloculina hyalina.

Minute differences in niche parameters of closely related species are sufficient to separate their niches and the biotic factors. A method providing a graphic representation of the Hutchinsonian niche and allowing comparison of the niche width

of three foraminifera (Allogromia laticollaris, Rosalina leci, and Spiroloculina hyalina) was designed and tested. A niche polygon is constructed for each species using six factors: temperature, salinity, pfl. feeding, interspecific competition, and intraspecific competition. The niche is estimated by measuring and comparing the areas of the polygons. An equation, based on competitive feeding experiments, was developed to reduce data to a single coefficient. Intraspecific competition appears to be an important factor limiting the exploitation of available space by A. laticollaris; crowding seems to have little effect on the other two species. The foraminifera feeding is affected by the quality and quantity of food. Experimental data and graphic analysis suggest that the niche of each experimental organism is different. A test polygon of Ammonia beccarii, a cosmopolitan generalist, was constructed; that species had the largest polygon and illustrates the utility of this method for niche comparison. (Auen-Wisconsin) W73-06132

UPTAKE AND METABOLISM OF DDT AND DIELDRIN BY MARINE ALGAE, Syracuse Univ. Research Inst., N.Y. H. C. Sikka, and C. P. Rice. Available from the National Technical Information Service as AD-744034, \$3.00 in paper copy, 30.95 in microfiche. Office of Naval Research, Arlington, Virginia, Annual Report No. 1, June 1972. 35 p. 6 fig., 4 tab., 20 ref. NR 306-050. N00014-72-C-0010.

Descriptors: "Pesticides, "Absorption, "Metabolism, "DDT, "Dieldrin, "Marine algae, Chlorinated hydrocarbon pesticides, Food chains, Phytoplank-

nydrocarbon pesticides, Food chains, Phytoplank-ton, DDE. Identifiers: *Pesticide metabolites, Skeletonema costatum, Cyclotella nana, Isochrysis galbana, Olisthodiscus luteus, Amphidinium carteri, Tetraselmis chuii.

Two investigations of the accumulation and metabolism of DDT and dieldrin by six species of different taxonomic divisions of marine different taxonomic divisions of marine phytoplankton are described. DDT uptake by the test species of Skeletonema costatum, Cyclotella nana, Isochrysis galbana, Olisthodiscus luteus, Amphidinium carteri, and Tetraselmis chuii increased linearly with increasing concentrations of DDT but non-linearly with increasing cell concentrations. Species with higher cell numbers per unit of mass took up greater amounts per unit weight han species with lower cell numbers. All species concentrated DDT to levels many times higher than the original concentration in the medium. All species converted small amounts of DDT to DDE, with maximum conversion to DDE by Tetrasselmis cultures. Skeletonema also produced a small amount of an unknown polar metabolite from DDT. Dieldrin uptake also increased linearly with pesticide concentration. With increased cell conventions and the contract of the contract DDI: Desurin uptake also increased finearly with pesticide concentration. With increased cell concentrations, Amphidinium accumulated dieldrin linearly, but Skeletonema, Tetraselmis, Olisthodiscus, Isochrysis, and Cyclotella uptake was non-linear. No species metabolized dieldrin. (Auen-Wisconsin) W73-06133

PLANT PATHOGENS AS BIOCONTROLS OF AQUATIC WEEDS, Florida Univ., Gainesville. Dept. of Plant Patholo-

gy. F. W. Zettler, and T. E. Freeman. Annual Review of Phytopathology, Vol 10, p 455-470, 1972. 87 ref. OWRR B-011-FLA (5). 14-31-

Descriptors: *Plant pathology, *Biocontrol, Aquatic weeds, *Aquatic weed control, Plant dis-eases.

The potential role of plant pathogens as biocontrols of waterweeds is considered and existing

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WATER QUALITY MANAGEMENT AND PROTECTION-Field 05 Effects of Pollution-Group 5C

literature pertinent to diseases of waterplants is reviewed. Whereas other biological control agents such as insects and fish have received considerable attention, researchers have largely overlooked plant pathogens as candidates for biocontrols of waterweeds. Existing research shows that plant pathogens are well adapted to an aqueous environment and that they can inflict serious damage to waterplants. Among the advantages of using plant pathogens as biocontrols are: (a) control applications require minimum technology and pathogens, once applied, are self-maintaining, (b) plant pathogens offer an unantached versatility in selecting a specific biocontrol, (c) plant pathogens, with rare exceptions, infect only plants and are not expected to be pathogenic to other life forms, and (d) plant pathogens, although often killing individuals within a population, are not likely to exterminate a given plant species. Research on this aspect of waterweed biocontrol abould be expanded considerably. As other types of agents are eliminated as useful control agents, plant pathogens may ultimately prove to be the most important key of all in eliminating waterweeds. (Morgan-Florida) W73-06206

THE QUALITY OF COASTAL WATERS: FIRST ANNUAL PROGRESS REPORT. Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 05G. W73-06259

THE INFLUENCE OF SEASONAL RAINFALL AND WATER TEMPERATURE ON THE POPULATION OF MERCIERELLA ENIGMATICA FAUVEL (ANNELDA:POLYCHAETA) IN THE ROSS RIVER ESTUARY, NORTH QUEEN-SLAND.

University Coll. of Townsville (Australia).

D. Straughan.

Journal of Experimental Marine Biology and Ecology, Vol 9, No 2, p 165-172, August 1972. 4 fig. 1 tab, 12 ref.

Descriptors: *Seasonal, *Rainfall, *Water temperature, *Estuaries, *Animal physiology, *Environmental effects, Brackish water, Saline watervironmental effects, Brackish water, Saline water-freshwater interfaces, Breeding, Larvae, Bioin-dicators, Australia, Ecological distribution, treshwater interfaces, Breeding, Larvae, Bioindicators, Australia, Ecological distribution, Animal populations, Tidal effects, Growth stages, Sampling, Annelids, Estuarine environment, Water levels, Marine animals, Reproduction. Identifiers: *Mercierella enigmatica, *Polychaetes, *Ross River, Macroinvertebrates, Survival.

A two-year study of breeding, larval settlement, and survival of Mercierella enigmatica Fauvel in the Ross River estuary indicates that the popula-tion is controlled primarily by the erratic seasonal tion is controlled primarily by the erratic seasonal rains. Water temperatures are always above the minimum for breeding (18 C) so that unlike populations in temperature ergions, breeding is not limited by water temperatures. Larvae settle only for short periods after freshwater flow. While peaks in larval settlement were reported on spring tides in the Brisbane River, they occurred on neap tides in the Ross Estuary. Merciserella survived for only short periods at both the freshwater and marine ends of its range, but throughout the period of observation in shallow brackish situations exposed to tidal flow on all tides. (Byrd-Battelle) W73-06262

AN ORDINATION OF PHYTOPLANKTON POPULATIONS IN PONDS OF VARYING SALINITY AND TEMPERATURE, Pace Coll., New York; and Haskins Labs., New M. Levandowsky.

M. Levandowsky.

M. Letandowsky.

M. Let Descriptors: "Phytoplankton, "Ponds, Plant populations, "Salinity, Environmental effects, "Water temperature, Systematics, "Simulation analysis, "New York, Aquatic algae, Aquatic habitats, "New York, Aquatic algae, Aquatic habitats, Chrysophyta, Mathematical studies, Ecological distribution, Water properties, Protzoa, Benthic flora, Water pollution effects, Gymnodinium, Hydrography, Chemical properties, Physical properties, Water sampling, Dissolved oxygen, Hydrogen ion concentration. Identifiers: "Ordination, Numerical taxonomy, Coccolithophores, Silicoflagellates, Prokaryotes, Sample preservation, Sedgwick-rafter counting chamber, "Long Island Sound, Flagellates, Enteromorpha.

Phytoplankton populations and hydrographic variables in two transient beach ponds and nearby Long Island Sound, New York, were observed from June, 1967 through November, 1968. Various indices of sample similarity are discussed, and a measure of taxa content similarity having certain desirable features was calculated for all pairs among 70 samples. This set of relations was used to construct a three-dimensional ordination. Two of the resulting principal axes are seen to be related to salinity and temperature. In these projections, no separate clusters of points are seen that would suggest that the taxa observed belong to well-defined, mutually exclusive communities with respect to salinity or temperature. (Mackan-Battelle) W73-06263

ORGANOCHLORINES IN THE SEASTAR ACANTHASTER PLANCI, Walla Walla Coll., College Place, Wash. Dept. of Biology. L. R. McCloskey, and K. H. Deubert. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 4, p 251-256, October 1972. 2 tab, 11 ref.

Descriptors: "Chlorinated hydrocarbon pesticides, "Pesticide residues, "Gas chromatography, "Chemical analysis, "Dieldrin, Marine animals, Tropical regions, Bioassay, Water pollution effects, Pollutant identification, "DDT. Identifiers: "Acanthaster planci, "Starfish, p p' DDT, Echinoderms, Animal tissues, Gonads, Chemical recovery.

Samples of gonad tissue from Acanthaster were collected during an investigation to determine via collected during an investigation to determine via gas chromatographic analysis the effects of pesticides on tropical marine fauna. Samples of the starfish gonads were collected from Guam, Caroline Islands, Hawaii, Mariana Islands, Marshall Islands, and the Great Barrier Reef. All samples were preserved in standard Bouin's fixative or in 5 percent formalin in seawater. The material was extracted with acetonitrile and quantitated and confirmed by ass acknowledges. material was extracted with acetonitrile and quantitated and confirmed by gas chromatography. The recovery was 88.7 percent for p.p'-DDT at 1 ppm in 0.06 g of tissue. Recovery was 87.1 percent for p.p'-DDT at 1 ppm in 12.7 g tissue (mean of four determinations). The amounts of insecticide residue in Acanthaster varied from 0.04 to 3.89 ppm for p.p'-DDT, and from 0.01 to 1.04 ppm for dieldrin. Of themselves, the residue values are of very limited value in ascertaining their biological significance to Acanthaster. As well, the effect of the residues on the ecology of Acanthaster cannot be determined. the ecology of Acanthaster cannot be determined. (Holoman-Battelle)
W73-06268

FORMALDEHYDE AS A POSSIBLE CAR-CINOGEN Columbia Univ., New York. Dept. of Microbiolo

H. S. Rosenkranz. Bulletin of Environmental Contamination and Toxicology, Vol 8, No 4, p 242-244, October 1972. 1 tab, 14 ref. Descriptors: Water pollution effects, *E. coli, Pesticides, Antibiotics (Pesticides), *Bioassay. Identifiers: *Formaldehyde, *Carcinogens, *DNA, *Polymerase, *Enzyme inhibition, Mutagens, Carcinogenicity, Streptomycin, Ampicillin, Cycloserine, Methyl methanesulfonate, Nhydroxylaminofluorene.

hydroxylaminofluorene.

A microbial assay system has been used to determine the carcinogenic potential of formaldehyde. DNA polymerase-containing and DNA polymerase-deficient forms of E. coli were grown medium HA supplemented with 5 micrograms/ml thymine and spread onto the surface of dagar plates of the same composition. When the surface of the agar had dried, a sterile disc impregnated with the substance to be tested was placed on the agar and the plates were incubated at 37 C for 7 hours at which time the diameter of the zones of inhibition was measured. The data indicate that formaldehyde preferentially inhibited the growth of the polymerase-deficient strain. Although the difference in the size of the zones of inhibition was small, it was reproducible. This small difference presumably reflects the fact that formaldehyde reacts with cellular structures other than DNA as well (e.g. proteins). The preferential inhibition of the polymerase-deficient strain was also exhibited by the known carcinogens methyl methanesulfonate and N-hydroxylaminofluorene. It was also shown that the 2 strains exhibited equal sensitivities to agents known not to effect cellular DNA (strentomycin, amnicillin and cycloserine). It was also shown that the 2 strains exhibited equal sensitivities to agents known not to effect cellular DNA (streptomycin, ampicillin and cycloserine). It is suggested that the continued universal use of formaldehyde be reevaluated and monitored since exposure to even low levels might be deleterious especially over prolonged periods of time. (Holloman-Battelle) W73-06269 W73-06269

IN VIVO AND IN VITRO EPOXIDATION OF ALDRIN BY AQUATIC FOOD CHAIN ORGAN-ISMS, Illinois Univ., Chicago. Dept. of Biological Sciences. For primary bibliographic entry see Field 05B. W73-06273

EFFECTS OF INSECTICIDES ON POPULA-TIONS OF RODENTS IN KANSAS - 1965-69, Kansas State Univ., Manhattan. Div. of Biology. For primary bibliographic entry see Field 05A. W73-06274

EFFECTS OF ESTUARINE DREDGING OF TOXAPHENE-CONTAMINATED SEDIMENTS IN TERRY CREEK, BRUNSWICK, GA. 1971, Georgia Univ., Sapelo Island. Marine Inst. C. J. Durant, and R. J. Reimold. Pesticides Monitoring Journal, Vol 6, No 2, p 94-96, September 1972. 2 fig, 1 tab, 2 ref.

Descriptors: Estuarine environment, "Bottom sediments, Chemical analysis, "Dredging, "Pesticide residues, Environmental effects, Chlorinated hydrocarbon pesticides, Oysters, Bioindicators, Soil analysis, Pollutant identification, Bioassay, Organic pesticides, Aromatic compounds, Halogenated pesticides, Sediments, "Gas chromatography, Mollusks, "Georgia, Solvent extractions, Outfall sewers, Water pollution effects, Separation techniques, Mud. Identifiers: "Electron capture gas chromatography, "Toxaphene, "Terry Creek (Geo), Sample preparation, Chemical recovery, Crassostrea virginica, Macroinvertebrates.

The possible reintroduction of toxaphene into estuarine biota from dredging and displacement of contaminated sediment in Terry Creek, Brunswick, Ga., was studied. The oyster (Crassostrea virginica) used as a bioindicator was analyzed as well as sediment samples. Each oyster sample was homogenized, mixed with a dessicant, and the mosture was alternately frozen and blended to ob-

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tain a free-flowing powder. The samples were then extracted with petroleum ether, partitioned with accetonitie, evaporated to dryness, and the residue eluted from a Florisil column with ethyl ether in petroleum ether. Sediment samples were mixed, dried, and mixed with a dessicant. Extraction and cleanup were identical to that for oyster samples. Oyster and sediment extracts were quantified using a 2-column electron capture gas chromatograph. Confirmation was accomplished using a mixed column of 5 percent QF-1 and 3 percent DC-200 (12:1 by weight). Recovery rates of toxaphene in oysters and in sediments were above 85 percent and 90 percent, respectively. In the estuary, the sediments near a toxaphene plant outfall were found to be contaminated with toxaphene approaching 2,000 ppm, and oysters collected 2 miles from the outfall were found to contain residue levels near 6 ppm. Analyses of oysters and sediment before and after dredging operations revealed no significant increase of toxaphene residues resulting from the dredging and resultant spoil runoff. (Holoman-Battelle)

THE INTENSITY OF INFLUENCE OF CERTAIN THE INTENSITY OF INFLUENCE OF CERTAIN
FACTORS WHEN ACTING TOGETHER ON
THE POPULATION OF THE CIRRIPEDIAL
BARNACLE BALANUS IMPROVISUS DARWIN,
Akademiya Nauk SSSR, Moscow.
V. N. Maximov, E. P. Turpaeva, and R. G.

Simkina.

Available from the National Technical Informa-tion Service as AD-742999, \$3.00 in paper copy, \$0.95 in microfiche. Defence Research Informa-tion Centre Translation No 2780, May 1972, Trans. of Okeanologiya, Vol 11, No 6, p 1090-1096, 1971. 3 tab, 7 ref.

Descriptors: "Environmental effects, Water pollution effects, "Food abundance, "Water quality, Animal populations, Crustaceans, Biomass, Immature, Growth stage, Industrial wastes, Mollusks, Statistical methods, Salinity.

Identifiers: "Balanum improvisus, "Barnacles, Arthropods, Macroinvertebrates, Tenellia adspersa, Cyanides.

sa, Cyanides.

In accordance with the plan for the fully factorized experiment PFE 2 to the 4th power, a study was carried out to determine the effect of food, freshening of the water, the presence of the homobranchial mollusk Tenellia adspersa Nordmann, and industrial effluent on the numbers of young and the biomass of Balanus improvisus. When other factors were absent, the experiments showed that industrial effluent reduced the numbers of young 50 times, and the biomass 12 times; food increased the biomass 3.5 times while Tenelia increased the numbers of young 1.5 times. When two or more factors were acting together, the effect changed. The overwhelming influence of effluent on the biomass weakened when freshening of the water took place and when food was added; the influence of food and fresh water became greater when industrial effluent was resent. The effect of Tenellia on the numbers of young in seawater was positive, but when industrial effluent was added it was negative. (Holoman-Battelle)

DETERGENT EFFECTS ON A REVERSE TRANSCRIPTASE ACTIVITY AND ON INHIBI-TION BY RIFAMYCIN DERIVATIVES, California Univ., Berkeley. Lab. of Chemical Biodynamics. Biodynamics. F. M. Thompson, L. J. Libertini, U. R. Joss, and

Science, Vol 178, No 4060, pp 505-507, November 3, 1972. 3 fig, 8 ref.

Descriptors: "Bacteria, "Enzymes, Water pollu-tion effects, "Detergents, Viruses, Biochemistry, Antibiotics (pesticides), Inhibition, Pesticides,

Identifiers: "Rifamycin, "Transcriptase, "RNA polymerase, "Noionic surfactants, Triton DN-65, Triton-100, Triton-1017, Brij-35, Polymerization, Ribonuclic acid, Bacterial physiology.

RNA-instructed DNA polymerase (RIDP), extracted from UCl-B tissue culture cells transformed by the Moloney leukemia virus, was subjected to different types and concentrations of nonionic detergents (Triton DN 65, X-100, X-101, and Brij-35) and its reverse transcriptase activity measured with respect to the effects of rifamycin derivatives. This polymerase is normally inhibited by rifamycin. Results show, however, that low concentrations of the detergents are not only activators of the RIDP activity but also form micelles that interfere with inhibition by rifamycin derivatives. (Mackan-Battelle)

RADIOECOLOGY OF ZN-45 IN ALDER SLOUGH, AN ARM OF THE COLUMBIA RIVER ESTUARY, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 05B.
W73-06283

SCHIZOMERIS - A GROWTH FORM OF STIGEOCLONIUM (CHLOROPHYTA:CHAETOPHORACEAE), Massey Univ., Palmerston North (New Zealand). Dept. of Botany. E. O. Campbell, and V. Sarafís. Journal of Phycology, Vol 8, No 3, p 276-282, Sep-tember 1972. 14 fig, 46 ref.

Descriptors: *Plant morphology, Variability, Water pollution effects, *Systematics, Chlorphyta, Aquatic algae, Environmental effects, Plant physiology, Electron microscopy, Autumn, Seasonal, Cultures, Aquatic plants, Cladophora, Mallard duck, Reproduction, Algae. Identifiers: *Ecophene, *Schizomeris leibleinii, *Polymorphism, *Stigeoclonium tenue, Protoderma, Uronema, Pearsoniella, Light microscopy, Centennial Lake, *New Zealand, Sample preparation, Oedogonium spp, Spirogyra spp, Ultrastructure.

Schizomeris leibleinii Kutz. was found as an ecophene of Stigeoclonium tenue (Ag.) Kutz. in Centennial Lake, Palmerston Nort, New Zealand. The Schizomeris form occurred in autumn when the water was polluted by a large number of ducks. Sampling of the plant population of the lake and culture work showed that S. tenue has a high degree of polymorphism. Other forms of it which developed both in the lake and in culture were indistinguishable from Protoderma Kutz. emend. Borzi, from Uronema Lagerheim, or from Pearsoniella Fitsch and Rich, respectively. (Holoman-Rattelle) Schizomeris leibleinii Kutz. was found as an

RESPONSE OF CHLORELLA PYRENOIDOSA TO ALUMINUM AND LOW PH, Agricultural Research Service, Beltsville, Md. Soil and Water Conservation Research Div. C. D. Foy, and G. C. Gerloff. Journal of Phycology, Vol 8, No 3, p 268-271, Sep-tember 1972. 3 tab, 19 ref.

Descriptors: "Hydrogen ion concentration, "Aluminum, Water pollution effects, "Toxicity, "Plant physiology, Resistance, Calcium, Limiting factors, Nutrient requirements, Acid mine water, Chemical wastes, Heavy metals, Aquatic algae, "Chlorophyta, Chromium, Nickel, Cobalt, Titanium, Nutrients, Waste water treatment, Mine acids, Water quality control, Alkaline earth letentifiers, "Chlorolle purposition,"

metals.

Identifiers: *Chlorella pyrenoidosa, Chemical interference, Chemical stress, Growth media, Culture media, Detoxification, Vanadium, Tungsten.

Chlorella pyrenoidosa, a green alga which has no measurable Ca requirement, tolerated much higher Al concentrations in solution than higher plants which require considerable Ca. This alga also gave significant positive yield responses to Al concentrations between 1.5 and 12 ppm (added at pH 4.6). The positive Al response was not attributable to V, Cr, Ni, Co, W, or Ti contaminants in the Al salt. At tolerance was isolated by subjecting the original Strain if (Fitzperald) culture to increasing Al stress. This strain, 1-Al, grew in stagnant cultures containing 48 ppm Al at an initial pH of 4.2. Its yield also was not significantly decreased by 48 ppm Al in serated cultures when both inoculum and solution pH were 4.6. Under the same conditions the original Strain I organism was injured by 3 and 6 ppm Al and was killed by 12 ppm. Algal strains which differ in Al tolerance may be useful (1) in studies on the mechanism of Al toxicity and mineral nutrition in general; and (2) in raising the pH, precipitating Al, and thereby detoxifying Alcontaining acid mine frainage water and commercial wastes. (Holoman-Battelle)

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NITROGEN METABOLISM OF AQUATIC ORGANISMS. IL THE ASSIMILATION OF NITRATE, NITRITE, AND AMMONIA BY BIDDULPHIA AURITA, Lamont-Doherty Geological Observatory, Palisades, N.Y.
N. S. T. Lui, and O. A. Roeis.
Journal of Phycology, Vol 8, No 3, p 259-264, September 1972. 3 fig, 4 tab, 23 ref.

Descriptors: "Nitrogen, "Metabolism, Marine algae, "Diatoms, "Nitrates, "Nitrites, "Ammonia, Enzymes, Assay, Chrysophyta, Nitrogen compounds, Sea water, Gas chromatography, Solvent extractions, Analytical techniques, Algae. Identifiers: Biological magnification, "Buddulphia aurita, Substrate utilization, Sample preparation, Enzyme activity, Organic nitrogen compounds, Brucine method, Assimilation, Culture media, Amides, Reductase, Enrichment, Culturing techniques, Ninhydrin method.

techniques, Ninhydrin method.

Biddulphia aurita, a centric diatom, can grow on either nitrate, a trirtle, or ammonia as its sole nitrogen source. Cells remove ammonia mitrogen from the medium 2.3-2.4 times faster than either nitrate or nitrite nitrogen and, when grown for 24 hr in the ammonium medium, contain higher levels of nonprotein nitrogen than cells grown in the nitrate or nitrite medium for the same period of time. The nitrogenous compounds in the non-protein nitrogen fraction from cells grown in the nitrate, nitrite, or ammonium medium contain the same level of soluble-free amino nitrogen, combined amino nitrogen, and ammonium mirrogen. The high level of soluble monprotein nitrogen in the medium of the cells grown in the ammonium medium is due to soluble amide nitrogen which represents 18 percent of the total soluble nitrogen present in these cells, whereas it represents only 2 percent in cells from the nitrate medium, and its level is negligible in cells from the nitrate medium, and its level is negligible in cells from the nitrate medium have both nitrate- and nitrite-reductase activity. Cells grown in the nitrite medium have only nitrite-reductase activity in significant levels, while cells grown in the numonium medium lack both enzymes. (Holoman-Battelle)

POLYMORPHISM IN THE DESMID MICRASTERIAS LATICEPS AND ITS TAX-ONOMICAL IMPLICATIONS, Institute de Botanica, Sao Paulo (Brazil). Phycolo-

gy Section. C. E. M. Bicudo, and L. Sormus. Journal of Phycology, Vol 8, No 3, p 237-242, Sep-tember 1972. 14 fig, 33 ref.

Descriptors: *Systematics, *Plant morphology, *Variability, Chlorophyta, Aquatic algae.

Identifiers: *Polymorphism, *Desmids, *Micrasterias laticeps, Micrasterias laticeps var. laticeps, Micrasterias laticeps var. ampliata, Cosmarium arthrodesmiforme, Cosmarium arthrodesmiforme var. latius, *Brazil.

arthrodesmiforme var. latius, "Brazil.

A case of polymorphism in the desmid Micrasterias laticeps Nordst is discussed. Material was collected from an artificial pond in the state of Sao Paulo, Brazil. A detailed examination of almost 400 specimens permitted a detailed description of 13 main morphological forms of the alga. The following conclusions were drawn: (1) for delimitation of genera and infrageneric taxa in desmids it is often necessary to examine sample populations; (2) the morphological characteristics presently used for delimitation of varieties in M. laticeps Nordst. seem to have no considerable tax-nonomic significance if isolated individuals are studied; (3) it is necessary to take into consideration Cosmarium arthrodesmiforme Borge and C. arthrodesmiforme var. latius Krieg, and Gerl., as well as M. laticeps Nordst. var. ampliata Krieg, when further studies are undertaken, because they may prove to be merely distinct morphological expressions of M. laticeps Nordst. var. laticeps. (Holoman-Battelle)

THE UPTAKE OF UREA BY MARINE PHYTOPLANKTON, California Univ., San Diego, La Jolla. Inst. of Marine Resources.
For primary bibliographic entry see Field 05B.
W73-06288

MICROBIOLOGY - WATERBORNE OUT-BREAKS, Environmental Protection Agency, Cincinnati, Ohio. G. F. Craun.

Journal Water Pollution Control Federation, Vol. 44, No. 6, p 1175-1182, June 1972. 82 ref.

44, No. 6, p 1175-1182, June 1972. 82 ref.

Descriptors: *Microbiology, *Water pollution effects, *Animal diseases, *Human diseases, *Vectors (Biological), Freshwater, Coliforms, Sampling, Sea water, Cultures, Epidemiology, Public health, Pathogenic bacteria, Trematodes, Turtles, E. coli, Salmonella, Snails, Animal parasites, Epizootiology, Identifiers: Methemoglobinemia, Leptospirosis, Tularemia, Pathogenic protozoa, Infectious Lepatitis, Salmonellosis, Icteric heptatitis, Acrodynia, Schistosomiasis, Meningoen-cephalitis, Dysentery, Gastroenteritis, Shigellas is, Shigella flexneri, Shigellas sonnei, Shigella typhimurium, Giardia lamblia, Pseudomonas aeruginosa, Vibrio cholerae, Leptospira canicola, Leptospira untumnalis, Leptospira canicola, Leptospira liomphalaria glabrata, Biomphalaria choanomphala, Biomphalaria pfeifferi, Bulinus africanus.

A recent review of the literature is presented on A recent review of the literature is presented on waterborne disease outbreaks in various countries. Most of the diseases are directly related to consumption of contaminated water. Some of the diseases discussed are gastroenteritis, Shigellosis, salmonellosis, infectious hepatitis, icteric hepatitis, shiga bacillus dysentery, cholera, tularemia, leptospirosis, amoebic meningoencephalitis, Manson's schistosomiasis, methemoglobinemia and acrodynia. (Byrd-Battelle) telle) W73-06301

EFFECT ON MYCOBACTERIUM TUBERCU-LOSIS PRODUCED BY SOME PACTORS IN-CIDENT TO SELF-PURIFICATION OF WATER BASINS, (IN RUSSIAN), For primary bibliographic entry see Field 05G. W73-06312

ECOLOGICAL STUDIES IN THE PLANKTON OF CERTAIN FRESHWATER PONDS OF HYDERABAD-INDIA. II. PHYTOPLANKTON-2, Osmania Univ., Hyderabad (India). Hydrobiology

Lab. G. Seenayya. Hydrobiologia, Vol 39, No 2, p 247-271, February 29, 1972. 5 fig. 7 tab, 48 ref.

29, 1972. 5 fig. 7 tab, 48 ref.

Descriptors: "Aquatic algae, Population,
"Cyanophyta, "Distribution patterns, "Biorhythms, "Nutrients, "Diatoms, Water quality,
Water pollution effects, Ecology, Phytoplankton,
Ponds, Organic matter, Carbon, Phosphates,
Nitrates, Bicarbonates, Nitrites, Hydrogen ion
concentration, Silica, Chlorophyll, Ammonia,
Chlorides, Water temperature.
Identifiers: "Periodicity, "India, Chlorophyll a,
Nitzachia palea, Navicula cryptocephala, Cymbella cymbiformis, Gomphonema gracilis, Nitzachia
amphibia, Gomphonema parvulum, Synedra acus,
Achaanthes minutissima, Achaanthes
microcephala, Gomphonema constrictum, Cymbella turgida, Amphora veneta, Rhopalodia gibba,
Epithemia zebra, Anabaenopsis raciborskii, Lyngbya mucicola, Gomphosphaeria, Chroococcus Horogome,
muetziagianum, Merismopedia tenuissima, Merismopedia punctata, Microcystis aeruginosa, Merismopedia minima.

The distribution and periodicity of diatoms and blue-green algae in three ponds are discussed. The polluted ponds harboured comparatively thinner populations of diatoms, in spite of the fact that they were rich in organic matter, phosphorus, and isorganic carbon. Temperature and bicarbonates played an important role in the periodicity of diatoms. Nitzschia gracilis gave rise to a bloom in one of the ponds soon after heavy rainfall, probably due to the sudden dilution of water. Concentrations of silica and phosphate were lowered in the water during growth of the diatoms in centrations of silica and phosphate were lowered in the water during growth of the diatoms in general. Blue-greens showed thick growths in ponds having a high nitrate content and pH around 9.0. Many of the species appeared in summer. Higher concentrations of nitrate, phosphate, and bicarbonate always preceded the increase in the myxophycean populations, but the concentrations of phosphate and bicarbonate were considerably reduced when the blue-greens attained peak. The sustained growth of blue-greens enriched the water in oxidizable and nitrogenous organic materials and rendered it more alkaline. This was probably the consequence of liberation of extraably the consequence of liberation of extracellular substances and withdrawal of CO2 from bicarbonate by the actively multiplying cells. Prominent algal species with their distribution pat-tern in the waters investigated are listed. (Little-Battelle) W73-06313

ONCHOCERCIASIS OF THE RIVER INGA REGION (DEMOCRATIC REPUBLIC OF THE CONGO, (IN FRENCH),
Universite Lovanium de Kinshasa (Congo).
K. Maertens, C. Rossetti, and A. Zola.
Ann Soc Belg Med Trop Parasitol Mycol. Vol 51,
No 6, p 683-700. 1971. Illus. English summary.
Identifiers: Africa, "Congo, Iaga River,
"Onchocerciasis, "Simulium-damnosum.

This region was weakly endemic compared to other Congolese foci, notwithstanding the ex-istence of Simulium damnosum breeding places which are probably the densest of the African conrecent appearance of the disease in the tinent. The recent appearance of the disease in the region and the poor vector-host contact could explain the scarcity and the benign character of the ocular lesions in this focus. A hypothesis on the evolution of onchocerciasis varying with the age of the patient and based on a study of the microfilarial density in the adult population is suggested.—Copyright 1972, Biological Abstracts, Inc. W73-06314 THE EFFECT OF MONOCHROMATIC LIGHT ON THE EXTRACELLULAR EXCRETION OF GLYCOLATE AND THE PHOTORESPIRATION IN THE BLUE-GREEN ALGA ANACYSTIS NIDULANS, (DIE WIRKUNG MONOCHROMATISCHEN LICHTS AUF DIE EXTRACELLULARE GLYKOLSAURE-AUSSCHEIDUNG UND DIE LICHTATMUNG BEI DER BLAUALGE ANACYSTIS NIDULANS), Frankfurt Univ. (West Germany). Botanical Inst. G. Dohler, and R. Koch. Planta (Berl.), Vol 105, No 4, p 352-359, 1972. 2 fig, 21 ref.

fig. 21 ref.

Descriptors: "Light quality, "Photosynthesis, "Respiration, Cyanophyta, Carbon dioxide, Tem-perature, Synthesis, Plant physiology, Algae. Identifiers: "Monochromatic light, Extracellular excretion, Glycolate, Anacystis nidulans, Light

An action spectrum of photorespiration which is identical with photosynthetic carbon dioxide uptake was measured. Algae grown under normal air conditions in a low light intensity were measured in normal carbon dioxide concentrations. A carbon dioxide gush was observed in the blue and far red regions at 20C; at 35C a carbon outburst appeared over the whole spectrum, and its magnitude varied with wavelength. Only at a low temperature (20C) and illumination with red light at 50 to 651 nm was a light induced glycolate release observed. After addition of a-hydroxy-2-pyridylmethane sulfonate glycolate was excreted during illumination at all used wavelengths. The magnitude of glycolate production was nearly the same in all cases; no glycolate excretion occurred at 35C in the whole region of the spectrum, but at that temperature, too, addition of a-HPMS forced release of glycolate in all wavelengths, indicating that glycolate biosynthesis was occurring. Results are discussed with reference to the physiological behavior of the algae and activation of photorespiration in blue light. The action spectrum of photorespiration is explained on the basis of a close relationship to photosynthesis. (Auen-Wisconsin)

ADAPTATION OF ROTIFERS TO SEASONAL

VARIATION,
Yale Univ., New Haven, Connecticut. Dept. of

Biology. C. E. King. Recology, Vol 53, No 3, p 408-418, 1972. 7 fig. 4

Descriptors: *Animal physiology, *Rotifers, *Adaptation, *Seasonal, Lakes, Model studies, Animal population, Genetics, Temperature, Cultures, Environmental effects. dentifiers: Euchlanis dilatata, Genotypes, Shortived generations, Clones, Genetic polymorphism.

lived generations, Clones, Genetic polymorphism. Adaptative structure of rotifer populations to seasonal lake variation was studied. Rotifers, Euchlanis dilatata, were periodically collected from nature, cloned, allowed to adapt to the laboratory environment for ten generations and then used to determine intrinsic rate of populations and then used to determine intrinsic rate of population around. Results indicated that physiological adaptation alone is not the major factor involved in adaptation to seasonal variation. Pattern of variation in population growth revealed genetic differences among clones collected at different times. Genetic discontinuity through time is presented in two models both of which assume that different genotypes are maximally adapted to different parts of the environmental spectrum. The first model further assumes that adults of all genotypes are present throughout the spring and summer but the genotype frequencies vary directly with the environmental variation. This model is the most likely statement of rotifer population structure if there is considerable gene flow throughout the population and if interclonal competition is not important. If the hypothesis of seasonal genetic discontinuity proposed is accurate, it does not create a

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new problem: it simply extends a zoogeographical paradox to a single lake. In the latter form, the problem is eminently approachable. (Jones-Wisconsin) W73-06317

AN EVALUATION OF CERTAIN INDICES OF EUTROPHY AND MATURITY IN LAKES, Miami Univ., Oxford, Ohio. Dept. of Zoology.

Hydrobiologia, Vol 40, No 2, p 223-245, 1972. 9 fig, 4 tab, 26 ref. NSF GY 5306.

Descriptors: "Classification, "Lake morphology, "Eutrophication, "Lakes, "Measurement, Biomass, Productivity, Pigments, Colorado, Primary productivity, Seston, Phytoplankton, Chlorophyll, Secchi discs, Trophic level. Identifiers: "Density indices, "Lake maturity indices, Species diversity, Pass Lake (Colo.), Black Lake (Colo.), Gaynor Lake (Colo.), Haydens Lake (Colo.), Allens Lake (Colo.),

In order to develop data for evaluation of lake maturity, five Colorado lakes, differing in altitude, water chemistry and degree of disturbance, were utilized to test the usefulness of net primary productivity, seston, chlorophyll-a, and Secchi disc transparency as indices of eutrophy. Diversity indices for both zooplankton and phytoplankton were calculated. Differences between lakes in zooplankton diversity were of a leaser magnitude were calculated. Differences between lakes in zooplankton diversity were of a leaser magnitude than were differences in phytoplankton diversity. The four indices were in essential agreement as to the relative degree of eutrophication in each lake. The concept of maturity is also considered by ranking the Colorado lakes according to several maturity indices: phytoplankton diversity, zooplankton diversity, Margalef's pigment ratio, productivity to biomass ratio, and assimilation number. The relative maturity of the lakes shifts considerably according to which maturity index one utilizes. Specific correlations between maturity indices (that is, a positive correlation between plankton diversity and pigment ratio) as suggested by Margalef, did not occur in these lakes. The data suggest that maturity may not be a meaningful suggest that maturity may not be a meaningful concept, or, that if it is, it has not been adequately characterized. (Jones-Wisconsin)

MANOMETRIC ASSESSMENT OF INTERSTI-TIAL MICROALGAE PRODUCTION IN TWO ESTUARINE SEDIMENTS, Oregon State Univ., Corvallis. Dept. of Botany. R. Z. Riznyk, and H. K. Phinney. Oecologia, Vol 10, No 3, p 193-203, 1972. 2 fig, 4 tab, 30 ref.

Descriptors: "Assessments, "Microorganisms, "Estuaries, "Sediments, Manometers, Interstices, Algae, Productivity, Cores, Sands, Silts, Respiration, Photosynthesis, Oregon, Migration, Salinity, Diatoms, Chlorophyll, Detritus, Benthos, Bacteria. Identifiers: Tidal flats, Yaquina Bay (Ore.), Sub-

Estimates of potential primary and community respiration of interstitial microalgae in two tidal flats in Yaquina Bay, Oregon, each representing a different sediment type, were obtained by recording periodic changes in gas volume using manometric techniques. Sediment cores from the Southbeach tidal flat showed a maximum amount of productivity in the lower intertidl zone whereas those from Sally's Bend showed no production in this zone. The upper cubic centimeter of sediment those from Sally's Bend showed no production in this zone. The upper cubic centimeter of sediment from both tidal flats had a higher amount of gross potential production than subsurface core sec-tions. Respiration to photosynthesis ratios indicate that respiration often exceeds photosynthesis on the Sally's Bend tidal flat. The sandy substratum of the Southbeach was more productive than the silty substratum of Sally's Bend. Production differences are attributable to the nature of the sediment-finer, detritus-rich sediment is associated with a denser bacterial and meiofaunal population which can reduce gross productivity of microalgae by competing with diatoms for nutrients, utilizing oxygen for respiration, and overgrazing of the diatoms. Sediment which is denser-grained has a higher algal biomass and a lower amount of organic detritus with the result that the bacterial and meiofaunal populations never become as dense as in finer grained sediment. (Jones-Wisconsin) W73-06319

AN ECOSYSTEM MODEL OF LAKE ALGAE

AN ECOSYSTEM MODEL OF LARGE ACCOUNTS OF THE AC

Descriptors: "Model studies, "Nuisance algae, "Eutrophication, Diurnal, Mathematical models, Photosynthesis, Respiration, Algae, Bacteria, Metabolism, Cycling nutrients, Grazing, Cost comparison, Nutrients, Water chemistry, Turbidity, Ecosystems, Fish, Benthos, Zooplankton, Heavy metals, Toxins. Identifiers: "Algal bloom dynamics.

As a step toward prediction of long-term trends and evaluation of measures proposed to combat accelerated eutrophication, an ecosystem model is described which provides a framework for interpretation of lake sampling data to clucidate cyclings of biological populations and of nutrients on the scale of hours to days. Roles of nutrients and predation in regulating biological production during the conditions of an algal bloom may be clarified. The ecosystem model of a lake undergoing an algal bloom consists of the several interconnected submodels: the major processes which must be considered in the description of an aquatic ecosystem are shown systematically and include a description of the fluid dynamics to account for passive transport of he biological populations and transport of nutrients in solution; an accounting of the net traffic of natrients into and out of the water, including equilibration with sediments and transfer of volatile solutes through the surface; energy balances to determine the amount of solar radiation incident on the lake surface which is actually available for biological production; and dynamics of the biological populations applying to all trophic levels up to the fish populations. (Jones-Wisconsin) W73-06320 As a step toward prediction of long-term trends

HISTORY AND RESULTS OF FISH INTRODUC-TIONS IN SASKATCHEWAN 1900-1969, Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology. T. L. Marshall, and R. P. Johnson.

Sask Dep Nat Resour Fish Wildl Branch Fish Rep. 8. p 5-29. 1971. Illus.

8. p. 3-29. 1971. Ilmus. Identifiers: *Fish establishment, Fish reproduc-tion, Canada, Coregonus artedii, Coregonus clu-peaformis, Esox lucius, Fish, Game, Perca flavescens, Salvelinus namaycush, *Saskatchewan, Stizostedion vitreum, Thymallus

Since 1900, 1.6 billion fish comprising 30 spp. have been introduced to fresh and saline waters of Saskatchewan. Indigenous species widely distributed into saline and new waters include lake whitefish (Coregonus clupeaformis), ciscoes (C. artedii complex), walleye (Stizostedion vitreum), perch (Perca flavescens) and northern pike (Esox lucius). The ranges of Arctic grayling (Thymallus arcticus) and lake trout (Salvelinus namaycush) have been extended southward. Introductions of a few 'minnows' and catostomids as forage for other species were made but never assessed. Exotic spe-

cies that have exhibited natural reproduction include the largemouth bass (Micropterus salmoides), smallmouth bass (M. doomieul), brook trout (Salwelinus fontinalis), brown trout (Salmotrutta), and rainbow trout (Salmo gardneri, Goldfish (Carassius auratus) flourished but were eradicated during spawaing. Survival without reproduction has been demonstrated by the American eel (Anguilla rostrata), kokanee (Onchorhynchus nertas), and splake (Salvelinus fontinalis X S. namaychus). American smelt (Osmerus mordax), crappies (Pomoxis sp.), bluegill (Lepomis macrochirus), alpine char (Salvelinus alpinus) and an unspecified ictalurid failed to survive. An introduction of coho salmon (Onchorhynchus kisutch) remains to be assessed. A variety of factors influenced the survival of species in new environments. These include dissolved O2, temperature, quality of dissolved minerals, stability of water levels, availability of spawaing areas, predation, shade, food supply, incomplete detoxification of rehabilitated lakes, and visibility of introduced stock.—Copyright 1972, Biological Abstracts, Inc. stracts, Inc

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DEVELOPMENT IN THE RED ALGA, GRIF-FITHSIA PACIFICA: CONTROL BY INTERNAL AND EXTERNAL FACTORS, Washington Univ., Seattle. Dept. of Botany. S. D. Washand, and R. Cleland. Planta (Berl.), Vol 105, No 3, p 196-204, 1972. 7 fig, 2 tab, 13 ref.

Descriptors: *Algae, *Rhodophyta, *Cytological studies, Biorhythms, Photoperiodism, Plant morphology, Plant physiology, Light intensity, Reproduction.

Identifiers: *Griffithsia pacifica, Circadian

rhythm.

rhythm.

Analyses of environmental effects on cell division and cell enlargement are difficult on many red algae, but Griffithian pacifica is well suited. Plants from isolated shoot cells develop rapidly so that environmental effects may be measured in a short time and its large cells allow easy analysis of both cell eloagation and cell differentiation. Development of single, non-nodal cells under a daily regime of 16 hour light, 8 hour dark was followed and which was affected by both external and internal factors: under 16:8 photoperiods, both cell division and cell elongation show a diurnal rhythm and the division rhythm persists for at least seven cycles in continuous light, and can be reset, indicating that the timing of cell division is controlled by an endogenous rhythm. Both cell division and elongation require light, but apical cell division inte and cell elongation rate are both relatively insensitive to either light intensity or photoperiod, Division in nodal cell, however, leading to branch formation, is strongly promoted by high light intensity or long photoperiods. By manipulating illumination conditions, Griffithsia plants, varying from unbranched to highly branched, can be obtained. (Jones-Wisconsin) W73-06322

EFFECT OF NITRATE ON NITROGEN-FIX-ATION BY THE BLUE-GREEN ALGA ANABAENA CYLINDRICA, Tokyo Univ. (Japan). Ocean Research Inst. M. Ohmori, and A. Hattori. Plant and Cell Physiology, Vol 13, No 4, p 589-599, 1972. 10 fig. 3 tab, 23 ref.

Descriptors: *Inhibition, *Nitrates, *Nitrogen fixation, *Cyanophyta, *Anabaena, Enzymes, Ammonia, Metabolism, Laboratory tests, Photosynthesis, Algae.
Identifiers: *Anabaena cylindrica, Heterocysts.

Modes of inhibition of combined nitrogen on nitrogen-fixation are complex and sometimes con-tradictory; type and degree of inhibition vary de-

pending upon the forms and amounts of the combined nitrogen supplied, as well as upon the test microorganism species. Effects of nitrate on nitrogen-fixation by Anabeana cylindrica were investigated in detail, particularly the variations in specific activity of nitrogen-fixation during growth in batch culture, since metabolic activities of microorganisms are apt to change, depending not only on external conditions but on internal conditions such as cell age and history. Results suggest that nitrate by itself acts neither as an inhibitor nor as repressor of nitrogenase in Anabeana cylindrica. At the late logarithmic phase, more than 50% of cell nitrogen was provided by nitrogen-fixation when the cells were grown in the presence of nitrate. Ammonia (concentration .001 M) ation when the cells were grown in the presence of nitrate. Ammonia (concentration .001 M) completely repressed formation of nitrogenase but had no effect on its activity. Nitrogen-fixing activity varied considerably during growth on N2 and the maximum activity was attained at the middle logarithmic phase; atmospheric nitrogen did not directly affect induction of nitrogenase. Nitrogenase synthesis in this alga appears to be controlled by the intracellular level of a certain nitrogenous metabolite. (Jones-Wisconsin) W73-06323

THERMAL STRATIFICATION AND ANNUAL HEAT BUDGET OF A FLORIDA SINKHOLE

LAKE, Florida Univ., Gainesville. Dept. of Zoology.

F.G. Nordie. Hydrobiologia, Vol 40, No 2, p 183-200, 1972. 8 fig. 6 tab, 8 ref.

Descriptors: "Thermal stratification, "Heat budget, "Florida, Lakes, Lake morphometry, Color, Turbidity, Circulation, Secchi disks, Sub-tropic, Sinks, Lidentifiers: "Sinkhole Lake, Lake Mize (Florida).

Identifiers: *Sinkhole Lake, Lake Mize (Florida).

Lake Mize, Florida, a typical sinkhole lake in its morphometric features, including its 'morning glory' basin shape, becomes stably stratified at superficial depths in early spring and remains thus until late fall or early winter; even violent hurricane winds do not break up the stratification. Stratification disappears by December and the lake's circulation pattern is typical of subtropical monomictic lakes—a single, extended period of circulation with the minimum temperature always well above 4C. Based on empirical evidence the extremely small annual heat budget is due to a number of factors including latitude, altitude, protected location of the lake, small surface area, and restricted solar heating. Gorham's regression equations relating annual heat budgets to various morphometric parameters of large temperate zone lakes are not useful for predicting the annual heat budget of a lake such as Lake Mize where the highest annual heat budget was roughly 1.6X that for the lowest of the three years. A fair amount of year to year variation in annual heat budgets is expected but since an extremely small annual heat budget is under consideration, small changes are magnified when viewed on a percentage basis. (Jones-Wisconsin) ones-Wisconsin)
W73-06324

NITROGENASE ACTIVITY, AMINO ACID POOL PATTERNS AND AMINATION IN BLUE-GREEN ALGAE, Duadee Univ. (Scotland). Dept. of Biological Sciences; and Dunstaffnage Marine Research Lab., Oban (Scotland). M. W. N. Dharmawardene, W. D. P. Steward, and S. O. Stanley. Planta (Berl.), Vol 108, No 2, p 133-145, 1972. 1 fig, 10 tab, 28 ref.

Descriptors: *Cytological studies, *Nitrogen fixa-tion, *Enzymes, *Cyanophyta, *Amino acids, Anabaena, Biochemistry, Inhibition, Ammonia,

Identifiers: *Glutamine synthetase, *Amination Anabaena cylindrica, Anabaena flos aquae Westiellopsis prolifica, Glutamate synthetase.

Several nitrogen-fixing blue-green algae have been investigated for the presence of the glutamine synthetase/glutamate synthetase/glutamate synthetase system using free amino acid pool patterns and specific enzyme assays, and evidence has been obtained that this pathway operates in blue-green algae under nitrogen-fixing conditions. The free amino acid poole in the nitrogen-fixing Anabaena cylindrica, A. Flos-aquae, and Westiellopsis prolifica contain aspartic acid, glutamic acid and the amide glutamine in much higher concentrations than the other amino acids, a characteristic found in organisms having glutamine synthetase/glutamate systhetase as an important pathway of ammonia incorporation. Under nitrogen-starved conditions, the level of acetylene reduction and the glutamine pool both increase but the free ammonia pool the level of acetylene reduction and the glutamine pool both increase but the free ammonia pool decreases, suggesting that ammonia rather than glutamine regulates nitrogen fixation. Glutamine synthetase has been demonstrated and glutamite synthetase also operates in nitrogen-fixing cultures of A. cylindrica. The enzyme is present in nitrogen-fixing cultures and activity is higher in aerobic than in microaerophilic cultures. Lowest levels of the enzyme are found in ammonium-grown cultures and activity in the presence of nitrate-nitrogen is lower than in aerobic cultures growing on elemental nitrogen. (Jones-Wisconsin) W73-06326

CYCLING OF ELEMENTS IN ESTUARIES, National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center. D. A. Wolfe, and T. R. Rice.

Fishery Bulletin of the National Oceanic and At-mospheric Administration, Vol 70, No 3, p 959-972, 1972, 3 tab, 51 ref.

Descriptors: *Estuaries, *Heavy
*Foreverters, Radioisotopes, Math Descriptors: "Estuaries, "Heavy metals, "Ecosystems, Radioisotopes, Mathematical models, Distribution, Transfer, Path of pollutiants, Southeast U.S., Water pollution effects, Water pollution, Toxicity, Sediments, Chemical proper-ties, Food chains, Stable isotopes. Identifiers: "Cycling metallic elements, Alkali metals, Alkaline earths, Transition elements, Rare earths, Actinide elements.

An improved understanding of interactions between waste materials and functional ecosystem octween waste materials and uncuous accessivem components is necessary to clarify information for development of models for cycling of costaminant metals (both radioactive and stable isciopes) in estuarine ecosystems. The important variables are defined with emphasis on coastal plain estuaries of the southeastern United States. Research will enable estimation of size ranges for manganese, iron, and zinc reservoirs. Mechanisms and pathways of elemental transformations and rates of elemental turnover among reservoirs, and response of these processes and reservoirs to environmental changes are studied. In aquatic ecosystems, nearly all metallic elemental content resides in the sediments and in the water. The biota fraction is small, phytoplankton and zooplankton constituting the most important living elemental reservoirs in terms of turnover and total physical transport and redistribution. In contaminated environments the major commercial species may concentrate certain elements to levels potentially harmful to people consuming large quantities of seafood. The general aspects of ecosystem structure and function likely to be most significant in governing element flux elemental transformations and rates of ele aspects of ecosystem structure and function likely to be most significant in governing element flux within and through estuaries are discussed and those elements known to be valid examples or ex-ceptions are identified. A conceptual systems model is presented as the preliminary phase in development of dynamic mathematical models of elemental cycling. (Jones-Wisconsin) 973.06327.

NITROGEN FIXATION BY EPIPHYTES ON SEA GRASSES, Alaska Univ., College. Inst. of Marine Science; and Texas Univ., Port Aransas. Inst. of Marine Sciences.
J. J. Goering, and P. L. Parker. Limnology and Oceanography, Vol 17, No 2, p 320-323, 1972. 1 tab. 10 ref.

Descriptors: *Nitrogen fixation, *Marine plants, *Algae, Texas, Biological communities, Brackish water, Shallow water, Rhodophyta, Phaeophyta, Cyanophyta, Chlorophyta, Diatoms, Bays, Primary production.

Identifiers: *Saa areas *Philiphytas Postfilia P.

Identifiers: *Sea grass, *Epiphytes, Redfish Bay (Tex.), Gulf of Mexico, Calothrix, Oscillatoria.

(Tex.), Gulf of Mexico, Calothrix, Oscillatoria.

Shallow marine and brackish waters of the bays and lagoons of the Gulf of Mexico abound with sea grasses. The spermatophytes and their epiphytes are generally the major producers of organic matter in these coastal ecosystems. The sea grasses provide excellent substrata for numerous species of brown, coralline red, blue-green, and green algae and distoms. They were examined for nitrogen-fixing activity as were also the sea grass leaves floating in the sea surface about 20 km offshore. Four sea grass species in Redfish Bay, Texas, Thalassis testudinum, Cymodocea manstorum, Diplanthera wrightii, and Ruppia maritima showed nitrogen-fixing activity as measured by acetylene reduction. In Thalassis communities, Calothrix, a genus of blue-green algae with proven nitrogen-fixing ability, was present on all four sea grass species and probably was responsible for the observed nitrogen fixing epiphytes remain active while at sea. Evidence that epiphytes and not the macrophytes are responsible for the fixation is presented that leads to the suggestion that nitrogen-fixing epiphytes play an important role in the nitrogen economy of sea grass communities. (Jones-Wisconsin) W73-06328

HERBICIDES IN THE BIOSPHERE, (IN GER-MAN), Hobenheim Univ., Stuttgart-Hohenheim (West

W. Koch.

Meded Fac Landbouwwet Rijksuniv Gent. Vol 36, No 3, p 814-830. 1971. Illus. English summary. Identifiers: Bees, *Biosphere, Fertility, Fish, *Herbicides, Mammals, Soils, Water pollution ef-fects, Weed control.

The effects of herbicides and their metabolites on the biosphere can be direct or indirect. Indirect effects are usually not specific for a herbicide but are generally characteristic for weed control measures. Attention should be given to the effects on man, warm blooded animals, fish, bees, water, soil fertility and plants.—Copyright 1972, Biological Abstracts, Inc.

W73-06329

THE ULTRASTRUCTURE OF SEVERAL DINOFLAGELLATES WITH EMPHASIS ON GONYAULAX MONILATA DAVIS, University of South Florida, Tampa.
J. T. Guadsmith, and C. J. Dawes.
Phycologia, Vol 11, No 2, p 123-132, 1972. 20 fig, 13 ref.

Descriptors: "Electron microscopy, "Dinoflagellates, "Cytological studies, Florida, Chromosomes, Pyrrophyta, Plant morphology. Identifiers: "Ultrastructure, "Gonyaulax polyedra, "Gonyaulax monilata, Prorocentrum gracile, Protoceratium reticulatum, Pyrodinium bahamense, Gymnodinium splendens.

Group 5C-Effects of Pollution

Further supportive evidence to the comprehensive dinoflagellate review by Dodge (Bot. Rev., 37:481-508, 1971) is presented in this study of the general ultrastructure of Gonyaulax polyedra and G. monilata with supplementary data from studies of Prorocentrum gracile, Protoceratium reticulatum, Pyrodinium bahamense, and Gymnodinium splendens. The method of preparation and serial sectioning for the electron microscope is described. Usual eukaryotic organelles such as porous, doule-membraned nucleus, mitochondria, Golgi bodies, chloroplasts, vacuoles, and 9 plus 2 flagelar structure were found. The organelles in each species were similar in structure with only minor differences in some species. Oil droplets and starch grains were scattered throughout the cells. Unusual features encountered were condensed chromosomes, trichocysts, fibrous vacuoles, circular mitochondria, a triple membrane-bounded plastid, a double membrane system enclosing the thecal platea, and evenly spaced tubules beneath the thecal membranes. A comparison of the ultrastructural features studied here and previously indicates that the internal make-up appears to be uniform with only minor differences between the species and genera. While cytological differences and similarities are toxonomically valuable, it does seem that the major criteria for speciation will remain in the light microscope realm of size, shape, plate number and placement, and plate sculpture. Jones-Wisconsin)

EFFECTS OF SIZE-SELECTIVE PREDATION AND FOOD COMPETITION ON HIGH ALTITUDE ZOOPLANKTON COMMUNITIES, Princeton Univ., N.J. Dept. of Biology.

W. G. Sprules. Ecology, Vol 53, No 3, p 375-386, 1972. 6 fig, 4 tab, 32 ref.

Descriptors: *Predation, *Foods, *Competition, *Zooplankton, Biological communities, Colorado, Copepods, Daphnia, Salamanders, Shrimp, Crustaceans, Distribution.
Identifiers: *Size-selective predation, Galena Mountain (Colo), Chaoborus, Ambystoma tigrinum, Diaptomus coloradensis, Diaptomus ahoabone, Daphnia rosea, Daphnia pulex, Branchinecta shantzi, Subalpine ponds.

Why predators are largely restricted to subalpine deep ponds and the extent to which chemical and physical factors, predation, and competition control zooplankton distribution was studied. On Galena Mountain, Colorado, in a series of small ponds, two distinct communities exist: In deep ponds, two predators, the culicid larva Chaoborus and the axolotl Ambystoma tigrinum, coexist with two small herbivores, the copepod Diaptomus coloradeasis and the cladoceran Daphnia. In shallow ponds, the predatory salamander, Ambystoma tigrinum, coexists with three large herbivores, Daphnia pulex, Diaptomus shoshone, and fairy-shrimp, Branchinecta shantzi, and the small Diaptomus coloradeasis. To determine why each community has remained resistant to invasion from the other for at least five years, survival of organisms munity has remained resistant to invasion from the other for at least five years, survival or organisms placed in cages in foreign ponds alone and in combination with the native species was investigated. Diaptomus shoshone and Daphnia pulex could not invade deep ponds probably because they were preyed upon by Chaoborus and the axolot, respectively. Chemical or physical conditions were limiting only for Daphnia pulex, which did not survive well in deep ponds. Daphnia rosea could not invade shallow ponds because the larger D. pulex outcompeted it for food. Diaptomus coloradensis survived in shallow ponds because it avoids competition with D. shoshone. (Jones-Wisconsin)

NITROGEN-LIMITED GROWTH OF MARINE PHYTOPLANKTON, L-CHANGES IN POPULA-

TION CHARACTERISTICS WITH STEADY-STATE GROWTH RATE, Hawaii Inst. of Marine Biology, Honolulu. J. Caperon, and J. Meyer. Deep-Sea Research, Vol 19, No 9, p 601-618, 1972. 7 fig, 3 tab, 28 ref.

Descriptors: "Limiting factors, "Nitrogen, "Marine plants, "Phytoplankton, Growth rate, Population, Ammonia, Cultures, Nutrients, Mathematical studies, Carbon, Chlorophyll, Oceans, Plant physiology. Identifiers: Cocoochloris stagnina, Cyclottella nana, Monochyais lutheri, Dunaliella tertiolecta, Continuous cultures, Chemostats.

Continuous cultures, Chemostats.

The relative variability of population carbon, nitrogen, chlorophyll-a, cell volume and cell concentration with steady-state growth rate is examined in the context of using these indicators of the physiological state of the population rather than environmental parameters, to determine steady-state nutrient-limited growth rate. Growth rates obtained from batch culture experiments where the nutrient experience of the population is continually changing are difficult to interpret but continuous culture techniques circumvent these difficulties by making growth rate determinations at constant nutrient conditions possible. Steady-state growth of Coccochloris stagnina, Cyclotella nana, Monochrysis lutheri, and Dunaliella teriolecta is examined in nitrate limiting medium and of Dunaliella and Monochrysis in ammonium limiting medium in continuous culture experiments. Growth rate cannot be directly related to observed nutrient concentration in a chemostat environment except perhaps in a long-term average sense. Mathematical studies show nitrate-limited growth rate is related to internal nitrogen per unit population by a hyperbolic expression. These results are consistent with an internal reservoir nutritional mechanism. Steady-state ammonium limited growth takes place without evidence of an internal reservoir, and nitrogen per cell remains constant over all growth rates studied, consistent with earlierwork. (Jones-Wisconsia)

DETERMINATION OF BORON IN WATER, NUTRIENT MEDIA, AND CHLORELLA NUTRIENT MEDIA, AND CHLURELLA CELLS, Argoane National Lab., Ill. Div. of Biological and

Argonne Na Medical Res

Medical Research. Landy McBride, William Chorney, and John

Botanical Gazette, Vol 133, No 2, p 103-106, 1972. 1 tab 9 ref

Descriptors: *Analytical techniques, *Boron, *Cultures, *Chlorella, Colorimetry, Algae.
Identifiers: *Nutrient media, Reagents, Boron

removal.

Part of the evidence needed to establish whether boron is an essential element for Chlorella growth requires quantitative determinations of boron concentration in nutrient media and in algal cells. Methods are presented for determining submircorgram amounts of boron in distilled water, nutrient media, and in Chlorella cells. Boron is determined colorimetrically as a boron-curcumin complex after either drying or ashing in the presence of calcium hydroxide. Boron is removed from distilled water by passing it through a column of Dowex-I one exchange resin in the hydroxl form. Ions which interfere with the boron analysis are removed on small columns of Dowex-I and Dowex-S0 in the formate and sodium forms, respectively. Neither column retains boron. Laboratory tap water contained about 100 micrograms per liter. Reagent-grade magnesium sulfate contained about 0.5 micrograms boron per gram which was reduced to 0.1 microgram boron per gram which was reduced to 0.1 micrograms boron standard added to Chlorella cells is recovered when calcium hydroxide is used to trap boron during evaporation hydroxide is used to trap boron during evaporation

and ashing. Regardless of the amount of boron supplied to Chlorella during growth only trace amounts were found in the cells. (Jones-Wiscon-

BEHAVIOURAL EFFECTS OF LEAD AND OTHER HEAVY METAL POLLUTANTS, Reading Univ. (England). Dept. of Organic Chemistry, D. Bryce-Smith. Chemistry in Britain, Vol 8, No 6, p 240-243, 1972.

Descriptors: "Lead, "Heavy metals, "Pollutants, Toxicity, Manganese, Mercury, Public health, So-cial aspects, Behaviour, Psychological aspects, Animal psychology. Identifiers: Neurotoxic pollutants, Toxicity.

At levels below conventional clinical thresholds, lead and some other neurotoxic metals appear capable of producing short-term and long-delayed effects on both behavior and intelligence. Although behavior is determined by complex causes, behavior as well as health can be adversely Although behavior is determined by complex causes, behavior as well as health can be adversely influenced by neurotoxic substances, some of which are widespread pollutants. Present levels of head (and to a lesser extent mercury) are so close to thresholds of potential clinical poisoning that possibility of subclinical behavioral effects among the population appears to require serious consideration. Nerve tissue, including the brain, is more sensitive to many foreign chemical substances than hitherto suspected. Toxic effects may appear as subtle behavior disturbances long before classical symptoms of poisoning become apparent. Lead, mercury, and manganese are of actual or potential significance as cumulative environmental pollutants. Industrial exposure to tetraethyl-lead, and poisoning through use of leaded petrol as a degreasing solvent are known. Lead in these organic forms has a special affinity for lipoid and nerve tissue and crosses unbroken skin and the blood-brain barrier much more readily than inorganic lead. Presez. and past levels of exposure to neurotoxicants may be associated with adverse effects on behavior. (Jones-Wisconsin) W73-06335

DISPERSAL OF ALGAE AND PROTOZOA VIA THE ALIMENTARY TRACTS OF SELECTED AQUATIC INSECTS, Union Coll., Cranford, N.J. Dept. of Biology. nary bibliographic entry see Field 05B. For primar W73-06337

SOME CHEMICAL AND PHYSICAL RELA-TIONSHIPS ON LAKE ONTARIO, Ontario Water Resources Commission, Toronto. M. D. Palmer. Water Research, Vol 6, No 7, p 843-855, 1972. 8 fig. 7 tab, 17 ref.

Descriptors: *Distribution, *Water che Measurement, Lake Ontario, Temporal distribu-tion, Spatial distribution, Wastewater (Pollution), Currents (Water), Temperature, Dissolved ox-ygen, Conductivity, Hydrogen ion concentration, Turbidity, Sampling, Instrumentation. Identifiers: Etobicoke Creek (Toronto).

The concurrent operation of recording chemistry and current instruments on a fixed tower at an off-shore location in Lake Ontario influenced by several waste discharges (the closest 1.6 km away) is discussed. Instruments operated in June and November, 1970, at 3.0 m off the bottom in 9.6 m of water and measured currents, temperature, dis-solved oxygen, conductivity, pH, and turbidity. Long-term period (greater than 15 hours) temporal variations of water chemistry are related to water movement patterns. Mid-depths concentrations of dissolved oxygen, pH and turbidity cannot be explained ments tions Knowl plain Need f usable better distance They a instanc

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plained on the basis of water movement measurements at the same location particularly for variations of 8-15 hours for June and November. Knowledge of currents only is inadequate to explain lake abore chemistry time distributions. Need for reliable recording chemistry instruments usable in offshore lake regions is indicated for a better understanding of near shore chemistry at distances of 2 km from known waste discharges. They are as important as current meters. In some instances, the effects of the near shore dynamics are random producing a normal distribution of the measured chemical parameters. (Jones-Wisconsin) W73-06338

THE PHOTOGRAPHER AS POLLUTER, Texas Univ., Dallas. Southwestern Medical School.

School.
M. Lorfing.
J Biol Photogr Assoc. Vol 40, No 2, p 61-62. 1972.
Identifiers: *Water pollution sources, *Pollutants,
Photography, Polluter, Sewage, Waste treatment,
Wastes.

Some data are given as to pollution from photographic wastes. Treatment may be necessary before these wastes go into a sewer system.—Copyright 1972, Biological Abstracts, Inc. W73-06340

CHEMICAL SURVEY OF THE TAMAR ESTUA-

CHEMICAL SURVEY OF THE TAMAR ESTUA-RY. I. PROPERTIES OF THE WATERS, Marine Biological Association of the United King-dom, Plymouth (England). E. I. Butler, and S. Tbitts. Journal of the Marine Biological Association of the United Kingdom, Vol 52, No 3, p 681-699, 1972. 10 ftg. 7 tab, 38 ref.

Descriptors: *Chemical properties, *Estuaries, *Water properties, Nitrogen, Iron, Sediments, Phosphorus, Mud, Salinity, Nitrates, Nitrites, Suspended solids, Humus, Nutrieats, Sea water, Inorganic compounds, Phosphates, Suspended load, Water pollution sources. Identifiers: *Tamar Estuary (England), English Channel, Dissolved organic nitrogen, Dissolved phosphorus, Dissolved organic phosphorus.

phosphorus, Dissolved organic phosphorus.

Progress of a study assessing organic and inorganic nutrients carried by an estuary to the sea is presented, focusing on the chemical properties of the Tamar Estuary which flows into Plymouth Sound. The estuary banks and bed consist almost wholly of soft mud which was taken into consideration during the studies. The ultraviolet absorbance of the water usually showed an inverse relationship to salinity with typical results illustrating the higher concentration of dissolved organic matter in the fresh water compared to the sea water, but no correlation between the ultraviolet absorbance and the dissolved organic introgen and phosphorus concentrations. The estuary catchment area contains varying amounts of iron, the peat bogs being particularly high. Considerable differences are shown in the concentrations of inorganic nutrients but the dissolved organic nitrogen concentrations are relatively similar. Dissolved iron has been estimated before and after the breakdown of organic compounds by photocombustion showing the buildup of humic substances and associated iron after heavy rain. When the concentration of suspended sediment in the water is high it can control the level of dissolved phosphorus by removing it from the rich water and releasing phosphorus into poor waters. (Jones-Wisconsin)

AN ECOLOGICAL STUDY OF SALMONELLA (IN JAPANESE), Azabu Veterinary Coll., Sagamihara (Japan). Dept. of Cattle Microbiology. For primary bibliographic entry see Field 05B. W73-05342

THE HETEROCYSTS OF BLUE-GREEN AL-GAE. III. DIFFERENTIATION AND NITROGENASE ACTIVITY, Westfield Coll., London (England). Dept. of Botany; and California Univ., Davis. Dept. of

Botany, S. A. Kulasooriya, Norma J. Lang, and P. Fay.
S. A. Kulasooriya, Norma J. Lang, and P. Fay.
Proceedings of the Royal Society of Edinburgh,
Vol 181, No 1063, p 199-209, 1972. 3 fig. 1 tab, 3

Descriptors: "Cyanophyta, "Enzymes, "Cytologi-cal studies, "Nitrogen fixation, Anabaena, Photosynthesis, Carbon, Oxygen, Algae. Identifiers: "Heterocysts, Anabaena cylindrica.

Identifiers: "Heterocysts, Anabaena cylindrica.

The sequence of events in heterocyst differentiation was investigated and an attempt made to relate changes in substructural organization and capacity to fix nitrogen to changes in chemical composition of the cells. The Anabaena cylindrica material, grown in the presence of ammonium hydrogen phosphate and free of heterocysts and pro-heterocysts when examined under the phase-contrast microscope, was suitable fro investigation of the initial stages of heterocyst during experimental period, for examination by light- and electron-microscopy, carbon and nitrogen analyses, and nitrogenase assay. Transformation of a vegetative cell into a heterocyst is characterized by dissolution of storage granules, deposition of a multilayered envelope, breakdown of photosynthetic thylakoids and formation of new membraneous structures; latter appear to develop by the coalescence of small newly formed vesicles arising in regions of pre-existing thylakoids. The course of heterocyst development was paralleled by that of nitrogenase activity both under aerobic and anaerobic conditions; anaerobic incubation enhanced heterocyst production as well as nitrogenase synthesis in Anabaena cylindrica is associated with heterocyst formation and the primary factor which may regulate both processes is the cellular C:N balance of the alga. (Jones-Wisconsin) sin) W73-06345

DISTRIBUTION OF PHYTOPLANKTON DUR-ING THE EARLY DEVELOPMENT OF VOLTA LAKE (1964-1968), Ghana Univ., Legon.

S. Biswas. Hydrobiologia, Vol 40, No 2, p 201-207, 1972. 3

Descriptors: *Impoundments, *Distribution pat-terns, *Phytoplankton, Reservoirs, Water levels, Thermal stratification, Diatoms, Discharge (Water), Turnovers.
Identifiers: *Volta Lake (Ghana), Synedra acus.

With closure of the dam at Akosombo, Ghana in May 1964, the Volta River System began to develop into a lake. Characteristic of the climate of the region is the prevalence of humid southwesterly winds bringing highest rainfall in June. During January to February when it is extremely dry, the northeasterly Harmattan wind prevails. An initial decrease of phytoplankton followed by increases both in density and diversity were early observed as the lake developed to its full extent. Some observations on the vertical distribution of temperature, dissolved oxygen, and phytoplankton in various parts of the lake during 1966-1967 showed a periodic movement of water layers started by the Harmattan wind and flood. At an offshore station near Ajena, three kilometers from the dam, earlier observations showed a well an offshore station near Ajena, three kilometers from the dam, earlier observations showed a well defined seasonal pattern of phytoplankton distribution that was subsequently lost as the production of hydroelectric power and occasional spill-in of the lake began. The distributions are shown by graphs. The substantially increased outflow during this period reduced stability and prevented stratification in the proximity of the dam. There was an

appreciable increase of phytoplankton dominated by the diatom Synedra acus during 1968. (Jones-Wisconsin) W73-06346

A MODIFIED SEDIMENTATION SYSTEM FOR COUNTING ALGAE WITH AN INVERTED MICROSCOPE, Royal Holloway Co., Englefield Green (England). Dept. of Botany. For primary bibliographic entry see Field 05A. W73-05347

PHYSIOLOGICAL STUDIES ON NITROGEN-FI-XING BLUE-GREEN ALGAE, Dundee Univ. (Scotland). Dept. of Biological

W. D. P. Stewart.
Plant and Soil, Special volume, p 377-391, 1971. 6 fig, 1 plate, 47 ref.

Descriptors: "Plant physiology, "Nitrogen fixa-tion, "Cyanophyta, "Inhibition, Oxygen, Photosynthesis, Aerobic conditions, Anabaena, Pigments, Azotobacter, Algae. Identifiers: Heterocystous algae, Non-hetero-cystous algae, Plectonema boryanum, Oxygen sensitivity, Acetylene reduction.

Recent developments in the physiology of nitrogen fixation by algae are summarized and some ways in which these may relate to the present ecological distribution of the group are indicated. Particular attention was paid to effects of oxygen and other physiological parameters on nitrogenase activity. The various types of blue-green algae known to fix nitrogen are considered and data on nitrogen fixation by cell-free extracts of blue-green algae are presented. Recent evidence for nitrogen fixation by pure cultures of unicellular and filamentous non-heterocystous forms suggests that a re-assessnon-heterocystous forms suggests that a re-assess-ment is necessary. Plectonema boryanum strain 594 has been studied in some detail; its development of nitrogenase activity is remarkable in that it develops under micro-aerophilic conditions but not under air when cultures are transferred from not under air when cultures are transferred from nitrate-containing to nitrate-free medium. Like other nitrogen-fixing algae Plectonema is capable of reducing acetylene to ethylene and the rates are comparable to, or better than those found with heterocystous algae. The alga can incorporate nitrogen and it increases in total nitrogen content in medium free of combined nitrogen. It is con-circulate that under the correct suricommental conceivable that under the correct environmental con-ditions a variety of non-heterocystous algae may develop an active nitrogenase. (Jones-Wisconsin) W73-0548

ECOLOGICAL ASPECTS OF PLUTONIUM DIS-SEMINATION IN AQUATIC ENVIRONMENTS, Woods Hole Oceanographic Institution, Mass.

Health Physics, Vol 22, p 537-549, 1972. 2 fig, 8

Descriptors: "Reviews, "Isotopes, "Aquatic environment, "Metabolism, Fallout, Sediments, Indicators, Strontium, Cesium, Radioisotopes, Marine biology, Toxicity, Water pollution sources, Freshwater, Food chains.

Identifiers: "Radioecology, "Plutonium, Transuranics, Neptunium, Americium, Promethium, Curium, Transformation.

Increased utilization of transuranics in the nuclear industry creates need to understand their biogeochemical behavior in the aquatic environment. This review considers some documented sources which contribute transuranics to the aquatic environment and particularly the ecological aspects of plutonium. Most Plutonium-239 present in the the environment has originated from both underwater and atmospheric nuclear tests. Quantities of transuranics were deposited in discrete marine

Group 5C-Effects of Pollution

environments near 'surface and underwater burst'
test sites; they are detected in the vicinity of fuel
reprocessing facilities, are introduced to aquatic
environments from accidents involving nuclear
devices, and from laboratories involved in nuclear
production or fabrication. Plutonium is highly concentrated by a number of marine species. To evaluate uptake and retention of plutonium in sediments, their lithological and chemical difference type and organic content, and biological activity
must be considered. Bone and liver are major
repositories for plutonium in marine vertebrates must be considered. Bone and liver are major repositories for plutonium in marine vertebrates while muscle tissue of both marine vertebrates and invertebrates contain relatively lower concentra-tions. When the relative biological effectiveness of alpha vs. gamma or beta radiation is considered, fallout Plutonium-29 contributes more than fal-lout Strontium-90 or Cesium-137 to artificial radia-tion exposure of mean particular of the contribution. tion exposure of many marine species. (Jones-

COOLING WATER CHLORINATION AND PRODUCTIVITY OF ENTRAINED

PRUDUCTIVITY

BY THY TOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
E. J. Carpenter, B. B. Peck, and S. J. Anderson.
Marine Biology, Vol. 16, No. 1, p. 37-40, 1972. 1 tab,

Descriptors: *Cooling water, *Chlorination, *Productivity, *Phytoplankton, Nuclear power-plants, New York, Sea water, Fouling, Marine algae. Identifiers: *Long Island Sound (N.Y.).

Chlorine is widely used for control of fouling or-ganisms in electric power plant cooling water systems. Effect of different chlorine concentrasystems. Effect of different calonine concentra-tions on productivity of coastal phytoplankton was measured at a nuclear power station on northeast-ern Long Island Sound. Observations were made on whether chlorine could be applied in doses strong enough to reduce fouling organisms yet low enough to leave entrained phytoplankton un-harmed. Eight concentrations of chlorine, contin-uests applied were used to measure productivity narmed. Eight concentrations of chlorine, continuously applied, were used to measure productivity. At the lowest concentration tested, too low to measure (0.1 ppm at the intake), productivity decreased 79% and at the highest concentration (addition of 1.2 ppm at intake, 0.4 ppm at discharge) it was 83% less than at intake. Substandischarge it was 83% less than at intake. Substandischarge it was 83% less than at intake. discharge) it was 83% less than at intake. Substantial decreases in phytoplanktonic productivity were noted at chlorine concentrations less than those required to eliminate fouling organisms (ca 0.25 to 0.75 ppm residual at discharge) and also when chlorine was applied intermittently. When no chlorine was applied to entrained seawater essentially no effect was noted on productivity. These data indicate that chlorine cannot be used effectively as a biocide for fouling organisms without having adverse effects on entrained phytoplankton. (Jones-Wisconsin) W73-06350

COLLECTION AND ANALYSIS OF WATER QUALITY DATA, Kansas State Univ., Manhattan. Inst. for Systems Design and Optimization.

J. S. Shastry, L. T. Fan, and L. E. Erickson.

Report No. 19, February 1970. 86 p, 1 fig, 9 tab, 12

Descriptors: "Rivers, "Water quality, "Analysis, "Basic data collections, Streams, Dissolved oxygen, Flow, Temperature, Instrumentation, Data storage and retrieval, Computers, Ohio River, Missouri River.
Missouri River.
Missouri River.
Missouri River, Open and Computers, Ohio River, Missouri River, Open and Computers, Ohio River, Stream flow, Coosa River, Detroit River, South Heights Station, Huntington Station, Stratton Station, Cincinnati Station, Omaha Station, Gibraltar Station.

Data are provided on temperature, dissolved oxygen, and stream flow acquired from various

sources. Methods are suggested for its effective use, and new techniques or improvements are recommended in existing data collection and handling. Development of new techniques for storage and retrieval is suggested. Inasmuch as water quality at any section of the stream depends on temperature, stream flow, distance from waste disposal points, and amount and type of plankton population, and the nature of bottom deposits, the design of data measurement and collection systems consists of developing techniques for each of these parameters. Water quality parameters usually reported are DO, BOD, coliform count, stream flow, and temperature. In developing kinetic models to describe stream purification, some measure of microorganism concentration is needed to predict metabolic activity in the stream. The high frequency data are stored on punched cards as well as on magnetic tape. For analysis the data can be retrieved either from the tape or from the computer deck by using the appropriate format. Spectral analysis of time series are specifically designed for analyzing this type of data with the exception for very small sampling intervals. (Auen-Wisconsin)

TURTLE-ASSOCIATED SALMONELLOSIS: III.
THE EFFECTS OF ENVIRONMENTAL SALMONELLAE IN COMMERCIAL TURTLE
BREEDING PONDS,
A. F. Kaufmann, M. D. Fox, G. K. Morris, B. T.
Wood, and J. C. Feeley.
Am J Epidemiol, Vol 95, No 6, p 521-528, 1972.
Identifiers: Breeding, Commercial, Contaminants,
Copper sulfate, Environmental effects, Ponds,
Salmonellae, *Salmonellosis, *Turtles, Louisiana,
Water pollution effects.

An epidemiologic study of turtle salmonellosis was conducted at a large Louisiana turtle farm. Environmental studies found high levels of Salmonella contamination in the H2O in turtle-breeding ponds as well as in adjacent swamp and bayou water, with similar serotypes being isolated from all locations. Salmonellae were also isolated from turtle nests in the pond bank. Salmonellae were not isolated from the turtle feed. Turtle eggs which were gathered daily were hatched in boxes containing sterile sawdust. The Salmonella excretion rate for groups of baby turtles hatched from these eggs ranged from 0-66.7% over a 3-yr period. Because transovarian transmission of Salmonellae could not be demonstrated, infection of the baby surtles appeared to result from Salmonellae in the could not be demonstrated, infection of the baby turtles appeared to result from Salmonellae in the pond environment penetrating newly-laid eggs. Salmonella contamination in the water of a test pond was reduced by treatment with 2-5 ppm of copper sulfate. Baby turtles hatched from eggs gathered at the copper sulfate-treated pond had a higher Salmonella excretion rate than similar turtles from untreated control ponds. The lack of efficacy in preventing Salmonella infections in baby turtles and potential side effects make copper sulfate unusable as a decontaminant for turtle ponds.—Copyright 1972, Biological Abstracts, Inc. W73-06357

EFFECT OF TEMPERATURE ON THE METABOLIC RATE OF SEA URCHINS, Oregon State Univ., Corvallis. Dept. of Zoology. R. J. Ulbricht, and A. W. Pritchard. Biology Bulletin, Vol 142, No 1, p 178-185, February 1972. 3 fig. 1 tab, 28 ref.

Descriptors: "Metabolism, "Temperature, "En-vironmental effects, Biology, Marine biology, Coasts, Marine animals, Bathymetry, "Oregon, Heated water, Thermal pollution, Water pollution effects. Identifiers: *Sea urchins.

Three species of sea urchins from along the Oregon coast were studied to ascertain their comparative compensation to thermal variations. Two

intertidal species the red urchin and purple urchin, and one subtidal species, the fragile urchin, were taken from their natural environments and subjected to tests not more than 2 or 3 days after their acquisition. Oxygen consumption and water pH were measured at temperatures ranging from 6 C to 24 C, with readings taken at 3 degree intervals. The purple urchin had a metabolic rate which was essentially independent of temperature, allowing it to maintain a constant metabolic rate in the face of a wide temperature range, such as that found in intertidal areas. The red urchin which is more subidal in nature had an essentially temperature dependent metabolic rate. The fragile urchin, which is found in deep waters, had a temperature dependent are which remained constant at low temperatures. It appears that the metabolic rate of each species is suited to the temperature fluctuations of its given environment. (Jerome-Vanderbilt)

TEMPERATURE SENSITIVITY OF MALTOSE UTILIZATION AND LAMBDA RESISTANCE IN ESCHERICHIA COLI B, Hebrew Univ., Jerusalem (Israel). Lab. of

Genetics.
A. Ronen, and O. Raanan-Ashkenazi.
Journal of Bacteriology, Vol 106, No 3, p 791-796,
June 1971. 5 tab, 7 ref.

Descriptors: "Bacteria, Chemical analysis, "Resistance, "Metabolism, "Genetics, Microbiology, Reproduction, Research, Biochemistry, "E. coli, Water pollution effects.

Identifiers: "Thermal sensitivity.

Identifiers: "Thermal sensitivity.

Escherichia coli B strains that have acquired the mal B region from E. coli k-12 are able to utilize maltose and to adsorb phage lambda when grown at 30 C but when grown at 40 C they do not absorb phage lambda and are devoid of amylomaltase activity. These maltose-lambda temperature sensitive cells can be mutated or transduced to become able to grow on maltose at 40 C but they still have no detectable amylomaltase activity nor functional lambda receptors at that temperature. This Mal40 phenotype is governed by a gene located near or at malA. It is suggested that the temperature sensitivity of both characters results from a defect in malT. However, transduction of malA from E. coli B to E. coli K-12 results in a wild-type phenotype, whereas E. coli B cells that have acquired malA from E. coli K-12 donors are still temperature sensitive for both amylomaltase and lambda-receptor production. (Jerome-Vanderbilt)

EFFECT OF GROWTH TEMPERATURE ON LIPID COMPOSITION OF THERMUS AQUATICUS, Kentucky Univ., Lexington. Dept. of Biochemis-

try. P. H. Ray, D. C. White, and T. D. Brock. Journal of Bacteriology, Vol 108, No 1, p 227-235, October 1971. 8 fig. 2 tab, 26 ref. AEC AT- (40)-1-4019, GB 78151-F02-GM45691-01.

Descriptors: "Bacteria, "Chemical analysis, "Temperature, Microbiology, Cytological studies, Growth rates, Research, Membranes, Stability, Thermal properties, Metabolism, Water pollution effects. Identifiers: *Lipids, Fatty acids, *Thermus aquaticus

The complex lipids of Thermus aquaticus include phospholipids, glucolipids, carotenoids, and vitamin K (2) isoprenologues. The phospholipids account for 30% of the total lipids and have been identified as phosphatidylethanolamine (4%), phosphatidyletylecrol (3%), phosphatidylinositol (10%), cardiolipin (3%), and phosphatide acid (1%). The major phospholipid contained three fatty acids, a long-chain unsaturated amine, and one glycerol per phosphate and accounted for 80%

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Therm Adapt fects.

Brook ously at a le resista resista the withe re the m gardle throug lower wheth indirect of the lipid phosphate. The carotenoids accounted for 60% of the membrane lipid. The majority of the carotenoids were very polar. Mono- and diglucosyldiglyceride and the 35-, 40-, and 45-carbon vitamin K (2) isoprenologues were also identified. All these lipids were localized in the membrane of T. aquaticus. When the growth temperature was increased from 50 to 75 C and measured at 5 C intervals, there was a progressive increase in the total lipid content. The phospholipids increased 2-fold, the carotenoids increased 1.8-fold, and the glucolipids increased 4-fold between cells grown at 50 C and 75 C. The vitamin K (2) level did not change. The proportions of the individual lipids within each lipid class remained constant as the temperature of growth was raised. Metabolic studies indicated turmover of the diacyl phospholipids during pulse-chase experiments at rates comparable with mesophilic bacteria. The major phospholipid and the carotenoids did not turn over. (Jerome-Vanderbilt)

INFLUENCE OF TEMPERATURE ON THE BIOSYNTHESIS OF IRON TRANSPORT COM-POUNDS BY SALMONELLA TYPHIMURIUM, Western Regional Research Lab., Berkeley, Calif. J. A. Garibaldi. Journal of Bacteriology, Vol 110, No 1, p 262-265, April 1972. 2 tab, 11 ref.

Descriptors: "Metabolism, "Inhibitors, "Iron com-pounds, "Pathogenic bacteria, Microbiology, Bac-teria, Cytological studies, Nutrient requirements, Thermal pollution, Disease resistance, Heating, Growth rates, Microenvironment, Water pollution

effects. Identifiers: Iron transport, *Salmonella typhimuri-

The biosynthesis of phenolate iron transport compounds by Salmonella typhimurium Tm-1 is temperature-sensitive. As the temperature of incubation is raised from 31.0 to 36.9 C, the organism tion is raised from 31.0 to 36.9 C, the organism excretes less iron transport compound into the medium. The organism is unable to grow at 40.3 C on a 1% succinate-salts medium unless supplemented with such iron transport compounds. The iron requirement for maximum cell yields on this medium is 0.10 microgram/ml. The biosynthesis of phenolate iron transport compounds is suppressed at iron concentrations greater than 3.0 microgram/ml. In discussion of these results speculation is made on the value of fever in humans as a mechanism for combating microorganisms in the body. (Jerome-Vanderbilt) W73-06363

HETEROGENEOUS ACCLIMATION OF FISH

HETEROGENEOUS ACCLIMATION OF FISH TO TEMPERATURE, Toronto Univ. (Ontario). Dept. of Zoology. F. K. Fahmy. Canadian Journal of Zoology, Vol 50, No 5, p 1035-1037, 1972. 2 fig, 13 ref.

Descriptors: *Aquatic environment, *Brook trout, *Heat resistance, Biology, Fish, Fish physiology, Thermal pollution, Temperature, Resistance, Adaptation, Heated water, Water pollution effects.

Brook trout were acclimated heterogeneously for 3 weeks by exposing the head and tail simultaneously to two different temperatures. Time to death at a lethal temperature was taken as a measure of resistance acclimation. The relation between the resistance acclimation. The relation between the resistance acclimation and mean temperature of the whole fish during acclimation indicated that the response of the whole organism depends on the mean thermal history of the total tissue regardless of the anatomical site. The mechanism through which a fish can acclimate to a higher or lower level of temperature is still unknown and whether the central nervous system has a direct or indirect role on such acclimation is not yet clear. (Jerome-Vanderbilt)

W73-06364

TEMPERATURE-SENSITIVE MUTANTS OF ESCHERICHIA COLI K-12 WITH LOW ACTIVITIES OF THE L-ALANINE ADDING ENTRY AND THE D-ALANYL-D-ALANINE AD-DING ENZYME, Utrecht Rijksuniversiteit (Netherla Microbiology Lab. E. J. J. Lugtenberg, and A. van Schijndel-van (Netherlands).

Journal of Bacteriology, Vol 110, No 1, p 35-40, April 1972. 2 fig, 2 tab, 8 ref.

Descriptors: "Biochemistry, "E. coli, "Metabolism, "Temperature, Microbiology, Cytological studies, Bacteria, Radiochemical analysis, Enzymes, Growth rates, Heat, Water pollution effects. Identifiers: Murein synthesis.

A number of properties of temperature-sensitive mutants in murein synthesis are described. The mutants grow at 30 C but lyse at 42 C. One mutant possesses a temperature-sensitive D-alanyl-D-alanine adding enzyme, has an impaired rate of murein synthesis in vivo at both 30 and 42 C, and contains elevated levels of uridine diphosphate-N-acetyl-muramyl-tripeptide (UDP-MurNAc-L-AlaD-Glu-m-Jiaminopimelic acid) at 42 C. The other mutant possesses an L-alanine adding enzyme with a very low in vitro activity at both 30 and 42 C. Its in vivo rate of murein synthesis is almost normal at 30 C but is much less at 42 C. When the murein precursors were isolated after incubation of the cells in the presence of Cl4-L-alanine, they contained only a fraction of the radioactivity that could be obtained from a wild-type strain. A genetic nomenclature for genes concerned with murein synthesis is proposed. (Jerome-Vanderbilt) W73-06365

STUDY OF VARIOUS POSSIBLE DESIGNS FOR WATER INTAKE AND OUTLET SYSTEMS OF LARGE POWER STATIONS, CONSIDERING HYDRAULIC PLANT OPERATING PROBLEMS AND SITE SUITABILITY, (QUELQUES CONSIDERATIONS SUR LE CHOIX DU SYSTEME PRISE-REJET DES GRANDS AMENAGEMENTS THERMIQUES SELON LEUR LOCALISATIONS TION), Laboratoire National d'Hydraulique, Chatou

(France).
For primary bibliographic entry see Field 08C.
W73-06368

DIVISION SITE REGULATION IN A TEM-PERATURE-SENSITIVE MUTANT OF BACIL-PERATURE-SEGULT ELUS SUBTILIS, Arizona Univ., Tucson. Dept. of Microbiology and Medical Technology.

N. H. Mendelson.

Journal of Bacteriology, Vol 111, No 1, p 298-300,
July 1972. 2 fig, 11 ref. GB 17022 R01 GM 18735-

Descriptors: *Length, *Temperature, Microorgan-isms, Chromosomes, Bacteria, Reproduction, Genetics, Size, Water pollution effects. Identifiers: Mutant bacteria, Cell nucleus, *Bacilus subtilis.

A study was performed to ascertain data on the ef-A study was performed to ascertain data on the effects of temperature upon the location of the division site along the cell length, and of the transfer-ral of DNA, in Bacillus subtilis. Germination and outgrowth at 30 C results in crosswalls produced at regular length intervals, creating a population of nearly uniform length, all with DNA. At 45 C a population of cells of greatly varying size results, with the smallest cells in a four-cell clone containing no DNA. As division continues at 45 C additional anucleate cells are produced. (Jerome - VarGROWTH RATE OF ESCHERICHIA COLI AT ELEVATED TEMPERATURES: REVERSIBLE INHIBITION OF HOMOSERINE TRANS-SU-CLINYLASE,
Tel Aviv Univ. (Israel). Dept. of Microbiology.
B. Z. Ron, and M. Shani.
Journal of Bacteriology, Vol 107, No 2, p 397-400, August 1971. 4 tab, 2 fig, 12 ref.

Descriptors: *Bacteria, *Growth rates, *Tempera-ture, Biochemistry, Assay, Microbiology, Ther-mal pollution, *E. coli, Enzymes, Inhibitors. Identifiers: Homoserine Trans-succinylase,

This study reveals a direct relationship between the decrease in activity of the homoserine trans-succinylase enzyme and increases in temperature. It suggests that in elevating the temperature a direct conformational change is caused in the en-zyme molecule, which inhibits its activity. For a zyme molecule, which inhibits its activity. For a more precise study, the enzyme was extracted from cells of mutant CW3747 and subjected to varying temperatures. The HTS activity in an extract and in the cell was optimum at about 33 C, and decreased progressively with increasing temperature. At 44.5 C activity was found to be less than that at 37 C, but a rapid reversal of this effect could be achieved by returning the enzyme to 37 C. If the extract was placed at a temperature of 47 C for 10 minutes, the effect was no longer reversible. A similar effect was also observed when urea was introduced in progressively larger quantities. Essentially full activity was restored when inhibitors were removed by dialysis. (Jerome - Vanderbilt) derbilt) W73-06376

PARAMETERS NECESSARY FOR ANALYZING THERMAL BIOASSAYS ON MARINE FISH.

R. D. Smith.

Journal of the Sanitary Engineering Division,
American Society of Civil Engineers, Vol 98, No
SA6, p 973-985, December 1972. 9 fig, 2 tab, 2 ref, 1 append.

Descriptors: 'Fish, 'Bioassay, 'Thermal pollution, Environmental effects, Nuclear power plants, Aquatic environment, Marine fish, White perch, Analytical techniques, 'Chesapeake Bay, Estuaries.

Identifiers: Acclimation, Critical temperature,

Concern over the effects of thermal discharge into the Chesapeake Bay has led to this and other studies on the associated response of indigenous fish. The white perch was chosen for these experiments because it is a populous and important species of average sensitivity. The two primary points investigated were (1) whether or not the prescribed exposure period for the standard bioassay test, 72. hr., is adequate in tests related to thermal discharge, and (2) whether or not the parameter LD sub 50 satisfactorily describes the response of white perch to heated water. An acclimation rate of rise of 2.4 F per hour was used. It was discovered that the rate of temperature rise is of only slight significance in mortality. The critical temperature (lowest temperature for complete survival) increases linearly as acclimation temperature increases. With regard to bioassay studies into the effects of temperature change on a specific species, a 72 hr. test period is conservative, and a 36 hr. testing is recommended. The parameters critical temperature for zero mortality; critical temperature differential; and 50% kill differential are recommended over LD sub 30. (Jerome - Vanderbilt) Concern over the effects of thermal discharge into

QUANTIFICATION OF THE EFFECTS OF RATE OF TEMPERATURE CHANGE ON AQUATIC BIOTA, Army Engineer District, Buffalo, N.Y. J. N. Speakman, and P. A. Krenkel.

Field 05-WATER QUALITY MANAGEMENT AND PROTECTION Group 5C-Effects of Pollution

Water Research, Vol 6, p 1283-1290, 1972. 2 fig, 3

Descriptors: *Temperature, *Heated water, *Fish, Aquaria, "Rates of application, Thermal pollu-tion, Thermal powerplants, Fowerplants, Heat transfer, Fish migration, Fish behavior, Animal pathology, Adaptation, Lethal limit, Standards, Criteria, Environmental effects, Water pollution, Statistical methods, Sunfishes.

Identifiers: *Temperature tolerance, Rates of change, Acclimatization.

The rate of temperature change was shown to be an important factor in the survival of bluegills subjected to temperature increases from 5 to 30 C, from 10 to 30 C and from 5 to 25 C; and decreases in the reverse order. Lethal rates of temperature increase were at least 20 times the correspondi lethal rates of temperature decrease, substantiating the conclusion that rapidly onsetting low tem-peratures may constitute one of the greatest threats to the survival of fish. The results were combined with those of the shock and chronic tests to produce the three-dimensional representation of the temperature tolerance of the bluegill sunfish. Median rate limits are presented in tabular form and discussed extensively. Regression analysis was used to correlate data between the ultimate lethal limits (0 and 36 C) of the species. Analysis of linear regression planes proved that good first ap-proximations of the relationships among acclimatization temperatures, periods of accomplish-ment, and lethal temperatures were obtained. Various situations are discussed where fish could be subjected to rapid temperature increases or decreases. (Oleszkiewicz - Vanderbilt) W73-06384

WATER QUALITY STANDARDS.

Connecticut Water Resources Commission, Hart-

1970, 45 P. 9 FIG.

Descriptors: *Connecticut, *Water quality standards, *Surface waters, *Surveys (Data collections), Water quality, Water pollution control, Sea water. Fresh water. Interstate rivers.

On November 17, 1969, the Connecticut Water Resources Commission adopted water quality standards which were subsequently approved by the Secretary of the Interior in 1970 under the Federal Water Pollution Control Act. These standards apply to all interstate and intrastate waters and have four classes for freshwater and four classes for saltwater. All waters were then classified as to their present condition and adopted standard. Eight criteria used to establish standards for fresh water are: (1) dissolved oxygen, (2) sludge deposits, (3) color and turbidity, (4) coliform, (5) taste and odor, (6) chemical constituents. Seawater has the preceding eight criteria, plus radioactivity. Interstate waters will have to be maintained at present quality levels, or improved, unless the Department of Interior rules otherwise. (Poertner) W73-06469

SUBMERGED VEGETATION OF THE ROTORUA AND WAIKATO LAKES: I. LAKE

ROTOITI, Auckland Univ. (New Zealand). Dept. of Botany. For primary bibliographic entry see Field 02H.

5D. Waste Treatment Processes

REMOVAL OF FLUORINE AND ARSENIC FROM THE WASTE WATER OF THE RARE-EARTH INDUSTRY, Gosudarstvennyi Nauchno-Issledovatelskii i Proektayi Institut Redkometallicheskoi Promyshlennosti, Moscow (USSR).
T. Skripach, V. Kagan, M. Romanov, L. Kamen, and A. Semina.
In: Proceedings of the 5th International Water Pollution Research Conference, July-August 1970, Pergamon Press, Spring 1971. 7 p, 12 fig., 1 tab.

Descriptors: *Arsenic compounds, *Fluorine, *Waste water treatment, Industrial wastes, Iron, Hydrogen ion concentration, Heavy metals, Metals, Chemical reactions, Water treatment, Water pollution, Standards. Water pollution, St. Identifiers: USSR.

Cleaning industrial waste waters of fluorine must be effected with calcium oxide. The reagent con-sumption is 200% of the amount stoichiometrically required. The feasibility was shown of using ionrequired. The feasibility was shown of using ion-exchange resins and membranes for removing fluorine and other ions from waste water. Remov-ing arsenic from industrial waste water must be ef-fected with calcium oxide (pH value of about 8 and ing arsence from industrial waste water must be effected with calcium oxide (pH value of about 8 and process time of about an hour). Iron must be present in an amount which assures total removal of arsenic compounds. Treatment of industrial waste waters not containing iron salts must be conducted in the following way: (a) Oxidizing the three-valent arsenic compounds into the five-valent ones with 30% H2O2 and then treating with calcium oxide. (b) Oxidizing the three-valent arsenic compounds into the five-valent ones with yordusite and then treating with calcium oxide (pH value about 9-10, and agitation time -1 hour). When these conditions are observed, arsenic content in the purified waste water is 0.2 mg/l and requires a 4-fold dilution before discharge if water quality standards are to be met. (Oleszkiewicz-Vanderbili) w73-05874 W73-05874

WINNING HEAVY METALS FROM WASTE STREAMS, J. E. Browning. Chemical Engineering, p 62-63, April 19, 1971. 1

Descriptors: *Mercury, *Heavy metals, Metals, *Ion-exchange, Gold, Uranium, Resins, Industrial wastes, Copper, *Waste water treatment, Water

reuse. Identifiers: *Palladium, *Product recovery, Sweden.

Sweden.

Ion exchange technology may find increased usage as industry seeks ways to extract metals from effluents in order to meet more stringent pollution control laws. A new ion exchange process developed in Sweden is described which is capable of removing mercury from waste water. Ion exchange has been used successfully to recover metals such as uranium, gold, platinum, palladium and copper. Several selective resin materials are identified. The mercury level is reduced in two consecutive ion-exchange towers down to around 100 ppb in Q-13 resin tower and down to a few parts per billion in the final tower packed with Q-sorb resin. Investment costs for a plant of 40,000 gpd capacity are estimated at \$100,000. Operating costs are offset by the value of the mercury recovered. (Oleszkiewicz-Vanderbilt)

METHYL MERCURY AND INORGANIC MER-METHYL MERCURY AND INDIGGARIC MERCURY COLLECTION BY A SELECTIVE CHELATING RESIN, Bureau of Mines, College Park, Md. College Park Metallurgy Research Center.

For primary bibliographic entry see Field 05A.

W73-05891

DELINEATION OF AREAS FOR TERRESTRIAL DISPOSAL OF WASTE WATER, Idaho Bureau of Mines and Geology, Moscow. J. G. Bond, R. E. Williams, and O. Shadid. Water Resources Research, Vol 8, No 6, p 1560-1573, December, 1972. 9 fig. 11 ref.

Descriptors: "Waste water treatment, "Sprinkler irrigation, Groundwater, Groundwater movement, Water table aquifers, Shallow water, Idaho, Irrigation, Basalts, Fertilization, Water quality, Hydrogeology, Hydrologic aspects, Hydrologic systems, "Water reuse, "Waste water disposal. Identifiers: Renovation (Wastewater), Snake River Basin.

River Basis.

Renovation of waste-water, particularly with respect to organic and nutrient constituents, through irrigation with coincidental crop fertilization and groundwater recharge is proposed for hydrogeologically suitable portions of the Snake River plain, instead of expensive tertiary or sometimes secondary treatment. The region near Idaho Falls and Blackfoot has been used as a case study area to establish the methodology for selecting the most suitable terrestrial disposal sites. Safeguarding surface water and groundwater resources, providing for maximum probability of proper renovation of waste water, and minimizing design and supervision requirements are conditions that must be satisfied by any terrestrial waste water disposal project. The criteria for selecting sites that meet these conditions for proper disposal and renovation include gently aloping topography, a thick subsurface section of unconsolidated, unsaturated porous medium, a surficial mantle of high sand-silt content, and a well-understood shallow groundwater flow system. When evaluation and mapping apply to these criteria in the area around Idaho Falls and Blackfoot, the delineation of sections of land where successful terrestrial disposal of waste water can be expected is facilitated. (Campbell-NWWA) W73-05907

MODEL INVESTIGATIONS ON THE QUESTION OF DISINFECTION OF WASTE FROM SETTLEMENTS BY COMPOSTING (IN GERMAN),
I. Glathe, W. F. Hirte, K. Krannich, and F.

Moeller.

Z Gesamte Hyg Grenzgeb. Vol 18, No 1, p 1-6, 1972. Illus.

Identifiers: *Waste treatment, *Composting, Dis-infection, Escherichia coli, Salmonella give, Sewage, Sludge treatment, Survival, Tempera-ture, Time.

ture, Time.

The use of refuse and sewage sludge composts for fertilizer raises the question of the survival of pathogens. Two organisms were used in laboratory tests, Salmonella give and Escherichia coli, at various temperatures from 4 degrees-175 degrees. The vessels used held test composts in gauze bags and could be used either aerobically or anerobically. In anaerobic experiments, NH3 was absorbed with H2SO4. Waste sewage sludge material was used and inoculated with the bacteria in a fabric bag. Gas production and redox potential at were measured. The redox potential at 20-24 degrees rose gradually under aeroboc cpm-dotopms or varied somewhat about the starting value at 56 degrees. In the anaerobic experiments, there was a negative redox potential at 22 degrees or at 56 degrees after 7 days but later a positive potential appeared. The maximum negative potential was about 300 mV. The survival time of the bacteria was strongly affected by temperature. In the aerobic experiments, E. col died in 1-2 days at 70 degrees and 10-14 days at 42 degrees. At 4 degrees the bacteria were maintained for 85 days. They lasted longer under anaerobic conditions particularly at 42 degrees or less but at higher temperature the bacteria ded rapidly.—Copyright 1972, Biological Abstracts, Inc.

W73-059

WASTE THE CO ton, D.C. W. Rope Meeting Civil Er

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W73-05927

WASTEWATER MANAGEMENT STUDIES BY THE CORPS OF ENGINEERS,
Office of the Chief of Engineers (Army), Washing-

Office of the Uniet of Engineers (Army), washing-ton, D.C.
W. Roper.
Meeting Preprint No 1917, American Society of Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 12 p, 3 tab.

Descriptors: *Waste water treatment, *Waste water disposal, *Feasibility studies, *Sewage disposal, *Soil disposal fields, Land reclamation, Sewage treatment, Sewage effluents, Pollutants, Irrigation, Tertiary treatment, Water reuse, Illied. Irrigation, Tertiary treatment, Water reuse, a-linois. Identifiers: *Metropolitan Sanitary District of Greater Chicago.

Identifiers: "Metropolitan Sanitary District of Greater Chicago.

Beginning in February 1971, the Corp of Engineers undertook pilot studies of wastewater management for five metropolitan areas. The objective was to produce a feasibility report which would identify alternative means of reaching high wastewater quality standards on a regional basis. In approaching the task, four basic principles were set orth: (1) pollutants are resources in the wrong place and should be utilized, (2) water carrying the pollutants is useful, (3) treatment plant effluents should contain no more pollutants then the natural level of these pollutants and (4) the economic opportunities created by high levels of treatment should more than offset the economic cost. In early 1972, the Corps was requested to produce cost figures in conjunction with its study of the Metropolitan Chicago area. Alternatives analyzed were: (1) advanced biological treatment, (2) physical-chemical treatment, and (3) land treatment. Some factors, such as flood control, water supply, stream preservation and industrial and agricultural growth were indentified, but not used in the final analysis. There now exists over 100 municipal-type wastewater treatment facilities in the Chicago Metropolitan area. Advanced biological treatment on the least-cost basis would result in eliminating all but three of these plants and construction five new plants. Land treatment, found to be the best alternative, would eliminate all plants and would deliver the wastewater to an area 50 miles from downtown Chicago. Secondary treatment, und deplow. (Poertner) W73-05939

FINAL REPORT OF THE PENNSYLVANIA SANITARY WATER BOARD, 1923-1971. Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Manage-

For primary bibliographic entry see Field 06E. W73-05954

INSTITUTIONAL ALTERNATIVES FOR PROVIDING PROGRAMMED WATER AND SEWER SERVICES IN URBAN GROWTH AREAS: A CASE STUDY OF KNOXVILLE-KNOX COUNTY, TENNESSEE, Tennessee Univ., Knoxville. Water Resources Research Center. For primary bibliographic entry see Field 06A. W73-05955

COAL AND COAL MINE DRAINAGE. Bituminous Coal Research Inc., Pittsburgh, Pa For primary bibliographic entry see Field 05G.

AN INVESTIGATION OF CURRICULA MATERIALS AND METHODOLOGY FOR

TRAINING OPERATORS OF WASTEWATER TREATMENT PLANTS, North Carolina Water Resources Research Inst., Raleigh.

Rotte Caronna water Resources Research Inst., Raleigh.

J. C. Brown.

Available from the National Technical Information Service as PB-216 805; \$3.00 in paper copy, \$0.95 in microfiche. Water Resources Research Institute of the University of North Carolina, Raleigh, UNC-WRRI Report No. 74, December 1972. 114 p, 8 ref. OWRR A-054-NC (1). 14-31-0001-3533.

Descriptors: "Training, "Education, "Wastewater treatment, Operations, Operation and maintenance, "North Carolina, Training, Treatment facilities. Identifiers: *Waste treatment plant operators.

The skill and training requirements for four grades of wastewater treatment plant operators recognized under the North Carolina certification law are examined. A detailed list of skills is developed from which training curricula is proposed. Various methods for training operators are discussed, i.e., short schools, full time training, part time training coordinated with on the job training, correspondence courses, and special subject short courses. Available types of training materials are reviewed and the role of audio-visual materials is discussed. Recommendations are made for the development of an integrated program of operator training in North Carolina. The program would be developed under the supervision of the Office of Water and Air Resources of the Department of Natural and Economic Resources. The integrated program would require the continued cooperation of the North Carolina Water Pollution Control Association, the University of North Carolina and community colleges and technical institutes in various locations around the State. The integrated program would involve part time training at local institutions, short courses and special subject courses for higher level operators conducted at the University of North Carolina or elsewhere by qualified specialists and the development of appropriate audio-visual materials.

FLUIDIZED BED CLARIFICATION AS AP-PLIED TO WASTEWATER TREATMENT, Research Triangle Inst., Durham, N.C.

Research Triangle Inst., Durham, N.C.
J. C. Orcutt.
Copy available from GPO Sup Doc as EP 123/2:72032, \$1.50; microfiche from NTIS as PB-216 604,
\$0.95. Environmental Protection Agency,
Technology Series Report EPA-R2-72-032,
December, 1972. 98 p., 21 fig., 10 tab, 21 ref. EPA
Program 17030 EYA, 14-12-912.

Descriptors: "Coagulation, "Analytical techniques, "Chemical precipitation, "Waste treatment, Separation techniques, Flocculation, Water treatment, Seque treatment, Activated sludge, Sludge, Alum, Suspended solids, Mathematical studies, Hydrogen ion concentration.

Identifiers: Clarifier blanket, Removal efficiencies

In order to determine the effects of controlled process variables on the treatment achieved, an experimental study was made of the application of the fluidized sludge blanket clarifier to the coagulation and separation of wastewater solids. Systematic variation of wastewater pH, coagulant dose, upflow velocity and blanket depth was conducted in experiments using alum and ferric chloride coagulants. Regression analysis techniques were used to analyze the results and empirical relationships were derived relating the variables to the removal of suspended solids, total organic carbon, phosphorus, and coagulant metal ions. The operating variables were used to perform an empirical correlation with the sludge production rate. Both alum and ferric chloride were found to be effective

coagulants. Although, best removal efficiencies were achieved at lower rates, the sludge blanket acted as an efficient clarifier up to at least 15 feet per hour superficial velocity. (Smith-Texas) W73-06037

CALCIUM PHOSPHATE PRECIPITATION IN WASTEWATER TREATMENT,
California Univ., Berkeley. Sanitary Engineering Research Lab.
A. B. Menar, and D. Jenkins.
Copy available from GPO Sup Doc as EP 123/2:72-064, \$1.50; microfiche from NTIS as PB-216 605, \$0.95. Environmental Protection Agency, Technology Series Report, EPA-R2-72-064, December, 1972. 96 p, 25 fig, 15 tab, 48 ref. EPA Program 17080 DAR.

Descriptors: "Chemical precipitation, "Waste water treatment, "Phosphates, Chemical resctions, Filtration, Sedimentation, Separation techniques, Treatment facilities, Water pollution control, Water quality control, Sedimentation, Calcium carbonate, Calcie, "Settling basins.

Identifiers: "Tricalcium phosphate.

Identifiers: "Tricalcium phosphate.

Precipitation of calcium phosphate from both synthetically derived wastewater and from actual wastewater was investigated. An amorphous tricalcium phosphate was the steady state solid phase that controlled dissolved phosphate residual. The solubility of this phase determined from chemically defined systems was used with success to predict dissolved phosphate residuals from both chemically defined systems and actual wastewaters. Suspension settling was enhanced by magnesium hydroxide precipitation but not by calcium carbonate precipitation. In wastewater of moderate alkalinity and hardness, a phosphate removal in excess of 80% was consistently achieved at pH 9.5 with lime doses of, at the most, 200 mg/l as calcium carbonate. The overall phosphate removal performance was dictated by the performance of the precipitation reactor and its insuing sedimentation basin. Phosphate containing particles that escaped sedimentation could not be removed by filtration because they dissolved rapidly during the recarbonation process that necessarily precedes the filtration step. (Smith-Texas) that necessari (Smith-Texas) W73-06038

HOLLOW FIBER TECHNOLOGY FOR AD-VANCED WASTE TREATMENT, Monsanto Research Corp., Durham, N.C. J. D. Bashaw, T. A. Orofins, and J. K. Lawson. Copy available from GPO Sup Doc as EPI.23/2:72-103, \$1.25; from NTIS as PB-214 605, microfiche 50.95, paper copy \$3.25. Environmen-tal Protection Agency, Technology Series Report EPA-R2-72-103, December 1972. 91 p, 13 fig, 22 tab, 5 ref. EPA Program 17040 FEE. 14-12-926.

Descriptors: "Reverse osmosis, "Desalination processes, Desalination, "Membranes, "Waste water treatment, "Separation techniques, Treatment facilities, Semi-permeable membranes, Design criteria, Municipal wastes, Waste treatment, "Tertiary treatment.

Identifiers: "Hollow fiber technology, Cellulose acetate hollow fine fibers, Fiber spinning, Hollow fiber modules.

The possibility of using hollow fiber reverse osmosis membranes for secondary municipal effluent polishing was investigated through construction, laboratory evaluation, and monitoring in field service of various hollow fiber modules. All units were annealed for sodium chloride rejections of 80-95% at 250 psi external operating pressure, and all units incorporated cellulose acetate hollow fibers. Product water capacities ranged from 500 gallons per day. The module designs considered included the single seal end, looped fiber bundle; double seal end, parallel bundle; radial

Group 5D—Waste Treatment Processes

flow parallel bundle; and a rolled, woven hollow fiber fabric. The typical flux-rejection charac-teristics of the basic fiber system (4 gpd-95%) were teristics of the case their system (e.gpd-9799) were observed in waste water service, whereas the woven hollow fiber fabric design, showed improved retention of start-up characteristics and minimum effects of shell-side fouling during short-term field tests. (Smith-Texas)

UNOX GETS FIRST INDUSTRIAL TEST.

Environmental Science and Technology, Vol 6, No 10, p 878-879, October, 1972.

Descriptors: "Waste water treatment, "Industrial wastes, "Aeration, "Oxygenation, Suspended solids, Biochemical oxygen demand, Sludge treatment, Waste treatment, Activated sludge, Treatment facilities, "New York. Identifiers: *Unox, *Lederle Laboratories, Orangetown (N.Y.), *Pearl River (N.Y.).

Lederle Laboratories' answer to their treatment problems has been the installation of Union Car-bide's pure oxygen aeration package called Unox. Waste from the manufacturing operation is treated and the effluent with 50% of the BOD and 85% of and the siliuent with 50% of the BOD and 85% of the SS removed then goes to the Unox reactor. The clarified effluent is dumped to the sewer, vir-tually free of suspended solids and with a BOD reduction of almost 90%. (Smith-Texas) W73-06040

DOMES CONTROL SEWAGE PLANT ODOR.

Water and Sewage Works, Vol 119, No 9, p 93, September, 1972.

Descriptors: "Waste water treatment, Odor, "Treatment facilities, Water reuse, Water treat-ment, Aeration, Sludge treatment, Water supply, "Colorado, Cost analysis, Teritary treatment. Identifiers: "Colorado Springs (Colo), "Odor con-

Three large triodetic domes have been built over the trickling filters of the municipal pollution con-trol facility in Colorado Springs, Colorado in order to provide odor control. The domes have already cut the odor by 60%. One beneficial side effect was the greenhouse effect the domes had during the winter. This permits carrying an ambient temperature of about 57 degrees throughout the winter. (Smith-Texas)
W73-06043

RECLAIMING ZINC FROM AN INDUSTRIAL WASTE STREAM.

Environmental Science and Technology, Vol 6, No 10, p 880-881, October, 1972.

Descriptors: Zinc, Water pollution, Water pollution control, Water pollution sources, "Waste water treatment, Separation techniques, Treatment facilities, Economics, Flocculation, "Precipitation, Fish, Pollution abatement, *Delaware, *Recycling. Identifiers: *Zinc chloride reclamation, *Alkaline precipitation, *Red Clay Creek (Del).

The NVF Company that manufactures 45% of the world's vulcanized fiber has recently built a reclamation plant in an effort to stop zinc from pollutmation peant in an effort to stop zinc from poliuting Red Clay Creek. The process used was alkaline precipitation. The plant now recycles 50,000 pounds of zinc chloride per month for roughly the same price as the purchase price of fresh zinc chloride. (Smith-Texas) INCORPORATION OF NEW POLLUTION CONTROL. TECHNOLOGY IN PROCESS DESIGN AND CONTROL,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05G.
W73-06045

CENTRIFUGE IMPROVES INTRENCHMENT CREEK WATER POLLUTION CONTROL

PLANT, Atlanta Public Works Dept., Ga. Intreachment Creek Water Pollution Control Div. E. C. Vandiver, and J. A. Noble. Water and Sewage Works, Vol 119, No 9, p 102-104, September, 1972. 2 fig.

Descriptors: "Centrifugation, "Suspended solids, "Waste water treatment, Water treatment, Polymers, Coagulation, "Cost analysis, Sludge treatment, Sludge, Waste disposal, "Georgia, Treatment facilities.

Identifiers: *Power costs, *Alanta (Georgia), Intrenchment Creek (Georgia).

A centrifuge was installed in the Intrenchment Creek Water Pollution Control Plant. To provide Creek Water Pollution Control Plant. To provide the necessary added capacity would have required an additional two acres of drying beds, whereas the centrifuge only required 95 sq. ft. and does not depend on variable weather for drying. During the first year of operation, solids recovery was 90% with polymer added. At the present time a cost analysis of the polymer is underway. (Smith-Texally size of the polymer is underway. as) W73-06046

OZONE GENERATION AND ITS ECONOMI-CAL APPLICATION IN WASTEWATER TREATMENT, Grace (W. R.) and Co., Baltimore, Md. Pollution Control Systems.

H. M. Rosen.

Water and Sewage Works, Vol 119, No 9, p 114-120, September, 1972. 10 fig, 2 tab, 7 ref.

Descriptors: *Ozone, *Waste water treatment, Treatment facilities, Chemical reactions, Water treatment, *Oxidation, Activated sludge, Biochemical oxygen demand, Chemical oxygen demand, Color, Odor, Sludge treatment, *Disin-fection, Cost analysis, Design criteria, *Tertiary treatment. Identifiers: *Ozone generators.

There are three basic types of commercially available ozone generators: (1) Otto Plate Type. (2) Tube Type Generator, and (3) Lowther Plate-Type Generator. The Lowther Plate-Type is the Type Generator. The Lowther Plate-Type is the most advantageous because of operation on air or oxygen feed with less stringent drying requirements, air cooling, low operating voltages, small discharge gap, thin dielectrics, bligh frequency operation, and a high-yield efficiency resulting in high space efficiency. Ozone is useful in treating wastewater because it is a powerful oxidizing agent, its reactions are rapid, it is a highly efficient germicide, it leaves a beneficial oxygen residual as a reaction product and its reactions form generally nontoxic products. (Smith-Texas)

SEWER TAPPING METHODS,

Ecodyne Corp., Lenexa, Kans. Smith and Loveless Div. ry bibliographic entry see Field 08A.

DETERMINING OPTIMUM EFFICIENCY AND SIZE OF TREATMENT UNITS, Buck, Seifert and Jost, Morrisville, Pa. J. M. Foulds.

Water and Sewage Works, Vol 119, No 8, p R-137-R-139, August, 1972. 6 fig.

Descriptors: "Sewage treatment, Efficiencies,
"Activated sludge, "Trickling filters, Mathematical studies, "Filtration, "Waste water treatment,
Sewage, Sludge treatment, Treatment facilities.
Identifiers: "Material balance equations, Discharge efficiency.

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Material balance equations and discharge material balance equations were developed to evaluate two combinations of sewage treatment. The trickling filter and activated sludge plant and mixed-media filter combination demonstrated a possible way to meet rigorous treatment codes while making use of existing treatment units. The combinations that will be most effective in treating sewage can be quickly determined by the material balance equations. (Smith-Texas)

SIMPLE MEASUREMENT TECHNIQUE FOR SOLUBLE BOD PROGRESSION, Rice Univ., Houston, Tex. Dept. of Environmental Science and Engineering. For primary bibliographic entry see Field 05A. W73-06050

EVALUATION OF PARAMETERS AFFECTING EVALUATION OF PARAMETERS AFFECTING THE COLLOIDAL DESTABILIZATION OF SPENT VEGETABLE TANNIN LIQUOR, Virginia Polytechnic Inst. and State Univ., Blacksburg. W. A. Barkley. University Microfilms 300 N. Zeeb Rd. Ann Ar-bor, Mich, Order No. 71-11, 461. Ph. D. Disserta-tion, 1971, 185 p.

Descriptors: Color, *Tannery wastes, *Waste water treatment, Economics, Biological treatment, *Polyelectrolytes, Hydrogen ion concentraition, Industrial wastes.
Identifiers: *Hydrogen ion concentration control,
*Aluminum sulfate, *Color removal.

Color removal in tannery wastes by aluminum sulfate was investigated with pH control and polyelectrolyte addition. Aluminum sulfate concentration was the major factor in destabilization efficiency, with a combination of anionic polyelectrolytes and aluminum sulfate giving the best color removal. The optimum pH was 7 with a range of 5 to 7 being tested. The investigation defined economically feasible conditions for chemical removal of color. Subsequent biological treatment would be needed for adequate organic matter reduction. (Anderson-Texas)

W73-06052

FACILITY LOCATION AND ROUTING MODELS IN SOLID WASTE COLLECTION SYSTEMS, Johns Hopkins Univ., Baltimore, Md. D. H. Marks.
Univ. Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich 48106, Order No. 70-11,790, Xerox Copy \$9.45, Microfilm \$4.00. Ph. D. Dissertation, 1969, 266 p.

Descriptors: *Model studies, *Solid wastes, Waste disposal, Systems analysis, *Operations research, *Maryland, *Treatment facilities, Waste treatment. Identifiers: Collection facilities, *Baltimore

A study was made of the application of operations research to the analysis of solid waste collection, and models and techniques for facility location and routing were investigated. Facility location is discussed with emphasis on transfer facilities within a large-scale system. Finding the optimum flow through a given system is described. A multi-commodity truck assignment problem involving a common fleet of vehicles which carry several commodities between supply and demand points were used. Vehicle scheduling problems in which routes for individual collection vehicles were to be

located are discussed. Some of the methods developed were used to analyze the large-scale solid waste collection system in Baltimore, Maryland. Results indicated that the use of models could give information and insight into the planning and management of large public systems. (Murphy-Texas) W73-06053

WASTE WATER CLASSIFICATION BY GRAVITATIONAL ELECTRODIALYSIS, Rutgers - The State Univ., New Brunswick, N. J. T. Helfgott.
Available from Uni., Microfilms, 300 No. Zeeb Rd., Ann Arbor, Mich. 48106, Order No. 71-12,251. Ph.D. Dissertation, 1970. 348 p.

Descriptors: *Organic wastes, Boundary layers, Salts, Industrial wastes, Ions, Colloids, Sewage, Effluent, *Waste water treatment, *Electrodialysis, Water reuse. Identifiers: *Gravitational electrodialysis, Water renovation, Residual organics.

Gravitational electrodialysis (GED), an electro-Gravitational electrodialysis (GED), an electrotinetic technique that fractionates organics by
migration in an electric field, helps elucidate the
nature and response of organics in wastewaters.
Rising and falling boundary layers cause dispersed
charged organics and salts to gather at the bottom
and purified waters in a top pool. A process
flowsheet suggests a system for water renovation
and reuse. Analytic and process classifications are
shown for sewage, effluents and several industrial
wastewaters. (Gottschalk-Texas)
W73-06054

A PREDICTIVE MODEL FOR WATER POLLU-

TION,
New Mexico Univ., Alberquerque.
For primary bibliographic entry see Field 05B.
W73-06055

KINETICS OF AEROBIC UTILIZATION OF MIXED SUGARS BY HETEROGENEOUS MICROBIAL POPULATIONS, Georgia Inst. of Tech., Atlanta. S. Ghosh. University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich. 48106, Order No. 70-12,968, Xerox copy \$22.05, Microfilm \$6.25. Ph.D. Dissertation, 1970. 490 p.

Descriptors: *Biological treatment, *Waste water Descriptors: "Biological treatment, "waste water treatment, Biomass, Synthesis, Growth rate, Treatment facilities, Theorectical analysis, "Kinetics, "Aerobic conditions. Identifiers: "Competing substrates, "Influents, Enzyme systems, Supply precursors, Primary substrate, Secondary substrate, Glucose, Galactose, Sequential assimilation, Concurrent assimilation, "Chemostat reactor.

Research was conducted to provide information pertaining to the environmental, physiological, and biochemical factors of growth and assimilation of competing substrates contained in the influents to biological wastewater treatment processes. The enzyme systems capable of catabolizing each substrate compete for supply precursors for biomass synthesis and can cause interaction between the substrate components. The primary substrate, capable of supplying anabolic pathways with needed precursors fastest, naturally interacts first and in doing so, delays this process on the secondary substrate. Investigations were performed in a chemostat reactor maintained process on the secondary substrate. Investigations were performed in a chemostat reactor maintained at 20 degrees C with the influents containing glucose or galactose, or mixtures of the two as the competing substrates. Theoretical analyses found that in batch or plug flow reactors, the slow growers sequentially assimilated the substrates at rates below 0.6/hr., whereas the fast growers preferred concurrent assimilation, if the ratio of

substrate concentration exceeded 1.25:1. At this same ratio, the slow growers developed into or-ganisms capable of concurrent assimilation. Thus, the mode and kinetics of assimilation of competing substrates are determined by the individual subsubstrates are determined by the individual sub-strate concentration in relation to its specific growth rate functions, the relative growth rate curves of the various substrates, the concentration ratios of the substrates, and the type of flow model used for the culture system. (Gottschalk-Texas) W73-06056

THE HYDROLYSIS RATE OF CELLULOSE IN ANAEROBIC FERMENTATIONS, California Univ., Berkeley.

D. Chan.

University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich. 48106, Order No. 71-15,740. Ph.D. Dissertation, 1970. 186 p.

Descriptors: Chemical reactions, *Cellulose, *Anaerobic conditions, *Fermentation, Nitrogen, Suspended solids, Pulp and paper industry, Indus-trial wastes, *Waste water treatment, Waste treat-ment, Biological treatment, Model studies, *Hydrolysis, Kinetics. Identifiers: *Kinetic models, Dehydrogenase ac-

The Michaelis Menton kinetic model and the cell continuity equation used for describing the hydrol-ysis rate of cellulose in laboratory continuous flow anaerobic fermentors was used to characterize the anaerooic fermentors was used to characterize the system kinetics. Organic nitrogen concentration, volatile suspended solids concentration and dehydrogenase activity were the parameters used for assessment of the 'active cell mass'. Four laboratory continuous flow anaerobic fermentors were used. The experimental results gave the hydrolysis rate of cellulose and corresponding icrobiological kinetic constants which can be microbiologica inelic constants wince can be used for process analysis and design of cellulolytic wastes treatment. Growth association between the hydrolysis rate of cellulose and methane fermenta-tion rate in anaerobic fermentation processes was also demonstrated. (Albert-Texas)

CONCENTRATION OF TRACE ORGANIC CONTAMINANTS FROM AQUEOUS SOLU-TION BY FREEZING,

TION BY FREEZING, Pittsburgh Univ., Pa. R. A. Baker. University Microfilms 300 N. Zeeb Rd. Ann Ar-bor, Mich. 48106, Order No. 70-17,060 Xerox copy \$11.25, Microfilm \$4.00. Ph.D. Dissertation, 1969.

Descriptors: "Ser aration techniques, "Freezing, "Organic wastes, Analytical techniques, Ionization, Chromatography, "Waste water treatment, Water treatment, Measuring, Phenois, Aqueous solutions, Hydrogen ion concentration.

The main objective was to determine the feasibility of using freezing as a means of recovering and concentrating micro-organic contaminants from aqueous solutions while leaving their relative distribution and nature unaltered. Various factors affecting freeze concentration i.e., organic solute concentration, pH, mixing inorganic solute concentration, ice washing and cascades of multistage concentrations were evaluated. Goals were an improved analytical procedure to separate and measure the organic solute and the development of direct aqueous injection, gas-liquid chromatographic techniques using flame ionization detection. Some conclusions were: (1) kinetic analysis of the data demonstrates organic solute recovery or efficiency is dependent chiefly on inorganic solute content; (3) increasing interfacial concentrations of solute which alters the morphology of forming The main objective was to determine the feasibiliice front is the result of increasing ionic strength;
(4) solute-rich liquid is increasingly incorporated in
ice as inorganic solutes promote nonplanar,
dendritic ice formation and (5) combined gasliquid chromatographic analysis and freeze concentration techniques are advantageous over conventional procedures for separating and identifying trace organic solutes. (Albert-Texas)
W73-06058

LIMITING FACTORS IN OXIDATION POND

Washington State Univ., Pullman. G. M. Barsom.

O. M., Darsom. Available from University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich 48106, Order No. 70-18, 939, Xerox Copy \$16.90; Microfilm \$4.75. Ph. D. Dis-sertation, 1970, 371 p.

Descriptors: "Oxidation lagoons, "Limiting fac-tors, Biochemical oxygen demand, Suspended solids, Chemical oxygen demand, Nitrogen, Phosphorus, Sewage, Tertiary treatment, "Waste water treatment, "Water quality standards.

Several hundred validated cases of raw sewage, Several hundred validated cases of raw sewage, facultative, acrated facultative, acrobic complete mix and tertiary oxidation ponds were evaluated for effluent and aesthetic quality failures in accordance with the Illinois Department of Public Health effluent standards and federal receiving seater multipressions. Significant limiting federal receiving water quality criteria. Significant limiting factors in oxidation pond failures were available sunlight, light attenuation and photosynthetic oxygenation, wind driven turbulence and vertical mixing, sulfide generation and recycle versus removal. The following recommendations were made for constitutions of the control of tollowing recommendations were made for controlling oxidation pond effluent and aesthetic failures: (1) design and use of 'zero effluent' lagoons, (2) supplemental illumination and mixing followed by wasting and removal of suspended solids prior to discharge, (3) a treatment process for lagoons in compliance with accepted effluent standards and the intent and objectives of the 1965 Water Quality Act. (Albert-Texas)

MODELLING OXYGEN TRANSFER IN DIF-FUSED AERATION TANKS, Kansas Univ., Lawrence. D. W. Smith. Available from University Microfilms 300 N. Zeeb Rd. Ann Arbor, Mich. 48106, Order No. 71-13,363. Ph.D. Dissertation, 1970. 275 p.

Descriptors: "Aeration, "Activated sludge, "Waste water treatment, Water treatment, Ox-ygenation, 'Model studies, Mathematical studies, Diffusivity, Transfer, Sludge treatment, Sewage treatment, "Aerated lagoons. Identifiers: Oxygen deficit, "Oxygen transfer.

A procedure was developed for modelling diffused aeration tanks for the prediction of the overall transfer coefficient, KLa. The ability to predict thatster coefficients, it is a fee soliny to predict the amount of oxygen transferred into a system allows the engineer to apply more precise design criteria to activated sludge systems. The experimental tests included the construction of a series of geometrically similar square tanks with proportionate dimensions. The series of tests were performed by varying the water depth, air flow rate, and diffuser depth. The measurements of increase in oxygen concentrations as a result of aeration of water at a known rate were fed to a GE365 computer. Actual dissolved oxygen values were calculated and oxygen deficit versus time on semi-log scale was piotted. The value of overall transfer coefficients was calculated for the straight line portion of the plotted curve using a least square analysis. Two general relationships, based on theoretical developments, were developed. The functional relationship related Kt.a to air flow rate, liquid volume, and diffuser depth. The second relationship was based on a dimensional the amount of oxygen transferred into a system al-

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analysis. Both these relationships predicted the values for KLa for the test results within 10%. However, both relationships predicted the values of KLa lower than observed by other researchers. The accuracy of the modelling procedure was illustrated by predicting the value of KLa for the diffused aeration process using both the functional and dimensionless relationships. (Morparia-Texas) W73-60661

SEWAGE DISPOSAL STUDY TESTS SLUDGE ON CROPS.

Minnesota Science, Vol 28, No. 1, p 5, 1971.

Descriptors: *Sludge disposal, *Ultimate disposal, *Fertilizers, Sewage disposal, Heavy metals, Viruses, Nitrates, *Minnesota, Waste treatment.

At selected sites around the state of Minnesota, sewage sludge is being used on commercial crops such as corn, wheat and peas. Different amounts of wet and dry sludge are being tested on experimental plots. Researchers will compare corn crop response and soil and plant analyses from the various treatments. (Smith-Texas)

REMOVAL OF DISSOLVED CONTAMINANTS FROM MINE DRAINAGE, Utah Univ., Salt Lake City.

J. D. Miller. J. D. Muller.

Copy available from GPO Sup Doc as EPI.23/2
(72-130), \$1.25; microfiche from NTIS as PB-214
593, \$0.95. Environmental Protection Agency,
Technology Series Report EPA-R2-72-130,
December 1972. 33 p, 28 fig, 6 tab, 10 ref. EPA
Project 14010 FKX.

Descriptors: *Mine drainage, *Acid mine water, Chemical precipitation, *Rocky Mountain Region, Adsorption, *Waste water treatment, Iron,

Copper, Ions.
Identifiers: *Mill tailings, San Juan Mts.
(Colorado), Metal ions.

Identifiers: "Mill tailing, San Juan Mills. (Colorado), Metal ions.

Eleven mill tailing samples from locations throughout the Rocky Mountain region were tested for their effectiveness in removal of dissibilities of their effectiveness in removal of dissibilities of the sample of the Blaine Mill tailing, the average capacity of the tailings tested was 9.8 mg of iron per gram of tailing with a range of capacities from 6 mg/g to 15 mg/g. In batch tests the Blaine mill tailing exhibited a capacity in excess of 100 mg of iron per gram of tailing. For all tailing samples, with the exception of the Blaine tailing, removal was accomplished mainly due to hydrolytic adsorption of metal ions with a small contribution due to the inherent basicity of the tailing. In the case of the Blaine tailing, removal occurred via reaction with calcareous components of the sample. Continuous column, or stationary bed tests, in the laboratory and in the field were not nearly as effective. During the field test no aluminum was removed from the mine drainage and only 14 percent of the iron and copper were removed. During the test the pH rose from 2.85 to 3.5. It appears that for effective removal a stirred tank reactor will be required. If the results obtained in the batch test can be duplicated in the field, it is estimated that from 4.5 to 45.0 tons of tailing per day, depending on the capacity, would be required to remove iron from a mine drainage similar to the Gennesse. For a tailing similar to the Blaine tailing, approximately 200 lbs. of iron could be removed per ton of tailing. (EPA)

A PLAN FOR WATER-SEWER DEVELOPMENT IN THE LAKE-PORTER REGION, INDIANA. Lake-Porter Regional Transportation and Planning Commission, Highland, Ind. For primary bibliographic entry see Field 06B. W73-0607

TWENTY YEAR WATER AND SEWERAGE PLAN, Capital Region Planning Commission, Baton Rouge, La.

For primary bibliographic entry see Field 03D. W73-06079

A REPORT FOR H.U.D. CERTIFICATION FOR WATER AND SEWER FUNCTIONAL PLANNING AND PROGRAMMING FOR THE URBAN FORTION OF THE WACCAMAW DISTRICT OF SOUTH CAROLINA. Waccamaw Regional Planning and Development Council, Georgetown, S.C. For primary bibliographic entry see Field 06B. W73-06080

REGIONAL WATER AND SEWER PLAN (1971--1972). Ark-Tex Council of Governments, Texarkana,

For primary bibliographic entry see Field 06B. W73-06081

METROPOLITAN DEVELOPMENT GUIDE, SANITARY SEWERS, POLICIES, SYSTEM PLAN, PROGRAM.
Metropolitan Council of the Twin Cities, Minn.

January 22, 1970, 37 p. 4 fig. HUD grant.

Descriptors: "Sewerage, "Comprehensive planning, "Municipal wastes, "Water pollution control, Long-term planning, Water policy, Water pollution, Regional development, Urbanization, Waste water treatment, Facilities, Priorities, Future planning (Projected), Minnesott, Lidentifiers: "Twin Cities metropolitan area, "Policy "Implementation" icy, *Implementation.

Identifiers: "Item Chies metroponian area," Foricy, "Implementation.

The comprehensive plan for the metropolitan sewer system is in three parts. Parl I contains long-range policies as general guidelines for the proper planning, design, and operation of a sewer system in the Twin Cities Metropolitan Area that is designed to begin to correct the Area's increasing water pollution problem, provide the best long-range uses of rivers and lakes, and guide development. The text elucidates a wide range of sewage and water-related problems that the Council maintains can be corrected by the adoption of the policies spelled out, and their implementation by the Council, the Sewer Board, local governmental units, and private developers in the Metropolitan area. Part II contains the system plan for the metropolitan sewer system design for the year 2000. It includes a description of the general location of interceptors and treatment works and a description of alternative interceptor routes and treatment plant locations that are still under study. As new information becomes available through research and experience, additions and amendments will be made to both the system plan and the policies. Part III contains the development program, the timetable for the implementation of the sewer plan. It shows which interceptors and treatment works will be designed and built within the next year. The Council will formulate and adopt the development program will cover a one or two year period. Future programs will extend five years into the future. (Davis-Chicago)

WASTE WATER MANAGEMENT POLICY STATEMENT, MASON COUNTY, MICHIGAN. Mason County Planning Commission, Mich. For primary bibliographic entry see Field 05G. W73-06087

APPARATUS AND METHOD FOR TH REMOVAL OF IMPURITIES FROM LIQUIDS, Sayreco, Inc., Austin, Tex. (assignee). D. E. Sayre.

U. S. Patent No. 3,691,050, 4 p. 5 fig. 10 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 2, p. 632, September 12, 1972.

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Descriptors: "Patents, "Metals, Sea water, "Waste water treatment, "Coagulation, "Liquid wastes, Gold, Iron, Salts, Mercury, Electrodes, Electric fields, Activated carbon, "Filtration, "Flocculation, Water purification, Catalysts, Equipment, Abatement, Pollution abatement, Chemical wastes, Organic wastes, Water quality control, Water pollution control, Water pollution treatment.

ment. Identifiers: Silver, Platinum, Sodas, Metallic wastes, Inorganic wastes.

This apparatus is designed to precipitate organic and inorganic wastes from water by means of coagulating or flocking. The waste water is presented at a metallic liquid interface. Mercury is used as the catalyst, acting also as one electrode in the electric field; the other being a silver ring cathode. The electrodes are energized from a high voltage DC source. The treated water containing the flocked particulate is then directed to a settlement tank which has a mercury trap for reconstituting the catalyst. The water is then directed to an activated carbon filter system where it is further purified with unwanted odors and tastes being removed. (Sinha-OEIS)

FILTER, Clarkson Industries, Inc., New York. (assignee). W. J. Lee, and F. R. Kaess. U. S. Patent No. 3,690,466,4 p. 2 fig. 5 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 2, p. 504, September 12, 1972.

Descriptors: *Patents, *Filters, *Filtration, Equipment, *Waste water treatment, *Liquid wastes, Abatement, Pollution abatement, Water quality control, Water pollution control, Separation techniques. Identifiers: *Water pollution prevention.

A flat bed filter has a separate recirculation chamber communicating with the portion of the conveyor that supports the fresh filter medium. The chamber is sealed off from the main vacuum chamber and has an independent pressure system. The design is such that a pressure can be maintained which is substantially higher than the pressure in the main vacuum chamber. The pressure frop through the fresh filter medium at the end of the pool of contaminated liquid where the filter medium enters the pool is reduced and the flow of contaminated liquid through it is decreased. Special values are provided for regulating the flow of air through the apparatus. (Sinha-OEIS)

METHOD FOR SEPARATING OILS FROM WATER, M. Ohta.

U. S. Patent No. 3,689,406, 2 p, 1 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 1, p. 260, September 5, 1972.

Descriptors: "Patents, "Industrial wastes, Oily water, Oil wastes, Liquid wastes, "Oil pollution, Chemical wastes, "Filtration, "Filters, "Waste water treatment, Abatement, Pollution abatement, Water pollution control, Water quality control, "Cellulose, "Fibers (Plant), Separation techniques. Identifiers: "Water pollution prevention.

Factory wastes, such as mixtures of oil and water may be passed through a filter made of fiber composed of a hydrophilic cellulose selected from a group consisting of regenerated cellulose, mercerized cellulose and acetylated cellulose. The filter is mounted to the body of a drum or positioned in a support frame through which the liquid waste is passed. Subatmospheric or superatmospheric pressure may be applied to increase the

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

passing velocity. Four examples are given. (Sinha-OEIS) V73-06144

WATER TREATMENT APPARATUS.

W. Baerg.
U. S. Patent No. 3,688,911, 6 p, 5 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 1, p. 151, September 5, 1972.

Descriptors: "Waste water treatment, "Patents, "Water treatment, "Reverse osmosis, Water purification, "Semipermeable membranes, Membranes, Equipment, Separation treatment, Water quality, Water quality control.

The water treatment system comprises a reverse osmosis unit and a container so arranged that the container receives purified water from the reverse osmosis unit with the pressure within the container osmosts unit with the pressure within the container being the same as the pressure on the surface of the semipermeable membrane in contact with the purified water. There is a pressure responsive device to change the volume of the container. The container is held under atmospheric pressure. (Sin-ORIS) ha-OEIS) W73-06146

PURIFICATION ASSEMBLY, Svenska Interpur AB, Nacka (Sweden). (as-

Svenssa autopassignee). C. S. Nordgard. U. S. Patent No. 3,688,905, 4 p, 7 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 1, p. 150, September 5, 1972.

Descriptors: "Patents, "Waste water treatment, "Aeration, "Biological treatment, "Microorganisms, "Liquid wastes, Abatement, Pollution abatement, Water purification, Water treatment, Water quality control, Water pollution control.

A helical screw of sheet material carries active microorganisms. The helix is fitted around a horizontal, rotating shaft, and the outer periphery of the helix is tightly fitted within a cylindrical casof the helix is tightly fitted within a cylindrical cas-ing. End walls close off the casing, and a water inlet is provided in one end wall and a water outlet in the opposite end wall. Water moving through the casing passes over the helix surfaces where the biological activity takes place. The helix has aerat-ing holes in each turn to permit circulation of air in the axial direction. (Sinha-OEIS)

WATER TREATMENT PROCESSES, Weir Water Treatment Ltd., Cathcart (Scotland).

Weir Water Alexander (assignee).

J. R. Emmett.
U. S. Patent No. 3,687,843, 4 p, 3 fig, 1 ref; Official Gazette of the United States Patent Office, Vol. 901, No. 5, p. 1774, August 29, 1972.

Descriptors: "Patents, "Resins, "Ion exchange, Gases, Water treatment, Water quality, Water quality control, Water purification, "Waste water treatment, Liquid wastes.

A process involves the regeneration of spent particulate ion-exchange resins used in the treatment of water. The apparatus includes a particulate ion-exchange bed in the lower region of a container. There is a collector at the upper end of the particulate bed and entry device for upflowing treating liquids. The treating liquids pass upwards through the bed and out of the container providing presurized gas in the upper region of the container. Regeneration is effected in stages. At each stage gas from a source at a pressure in excess of that required to maintain the liquid at the depressed level is continuously released so that the need for the adjustment of gas flow at each stage of the regeneration cycle is avoided. (Sinha-OEIS)

DISTILLATION APPARATUS, Albright and Wilson Ltd., Olbury (England). (assignee). For primary bibliographic entry see Field 03A. W73-06151

METHOD AND APPARATUS FOR RECOVER-ING WATER FROM A HYDROCARBON SLUR-

RY, E-C Corp., Dallas, Tex. (assignee). D. B. Pfenning, and R. L. Brown. U. S. Patent No. 3,886,990, 7 p, 7 fig, 5 ref; Offi-cial Gazette of the United States Patent Office, Vol 901, No 4, p 1384, August 22, 1972.

Descriptors: "Patents, "Waste water treatment, "Organic wastes, Liquid wastes, Electric fields, Electrodes, Water treatment, "Freezing, Crystals, "Crystallization, Organic compounds, Separation techniques.
Identifiers: *Hydrocarbons.

The hydrocarbons sturry-water mixture is subjected to a high potential electric field developed between electrodes within a separation tank. The mixture is introduced slightly above the level of the water layer within the tank and is directed parallel to the interface between the water layer and the overlying layer of organic shury. The mixture is directed upward through widely spaced electrode grids provided in the upper portion of the tank. The separation process is well adapted for separations which involve exchange crystalization. Ice crystals are first frozen from a saline aqueous solution, and later are melted by applying pressure to the mixture of ice crystals with an organic liquid. The organic liquid undergoes partial freezing upon application of sufficient pressure to melt the ice crystals. (Sinha-OEIS)

METHOD OF AND APPARATUS FOR AERAT-

ING WATER, Standard Oil Co. (Indiana). Chicago, Ill. (as-

J. F. Grutsch, R. C. Mallatt, and R. G. Mowers. U. S. Patent No. 3,680,847, 5 p, 17 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 190, August 1, 1972.

Descriptors: *Patents, Equipment, *Aeration, Currents (Water), Water quality control, Water pollution control, Mixing, *Waste water treatment, Water treatment, Abatement, Pollution Identifiers: *Water pollution prevention.

Aeration takes places at different points about the center of the body of water in order to generate converging currents in the upper layers of water. The converging currents move to the central section generating a whirpool at the center. This generates diverging currents in the lower layers of the body of water. Partially submerged blades throw water into the air toward the central section of the body of water. The main support has a hexagonal configuration and includes at least six struts, each having one end at one of the six corners of the hexagon and the other end near but slightly off the center of the support, cables tying the struts together. Some of the blades provide an upward lifting force, some scoop up water and provide a downward pulling force. (Sinha-OEIS) W73-06155

AERATING APPARATUS AND METHOD, Improved Machinery, Inc., Nashua, N.H. (as-

signee).
L. A. Carlsmith, and K. E. Hartz.
U. S. Patent No. 3,680,845, 6 p. 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 189, August 1, 1972.

Descriptors: "Patents, "Aeration, Water treat-ment, Mixing, Turbulence, "Waste water treat-

ment, Water quality control, Water pollution con-trol, Abatement, Pollution abatement. Identifiers: *Water pollution prevention.

The apparatus comprises a footing support carrying an upward facing surface having depressions and protrusions or screens to promote aeration. A discharge nozzle, centrally located, causes mixing of water intermixed with air. The floating support slopes away from the center. Water washing outward from the center mixed with air before returning to the body of water. (Sinha-OEIS) W73-06156

EVALUATION OF WASTE WATERS FROM PETROLEUM AND COAL PROCESSING, Oklahoma Univ., Norman. School of Civil Engineering and Environmental Science. G. W. Reid, and L. E. Streebin.
Copy available from GPO Sup Doc as EP1.23/2:72-001, \$2.75. Environmental Protection Agency, Technology Series Report EPA-R2-72-001, December 1972. 205 p, 42 fig, 32 tab, 160 ref. EPA Program 12050 DKF.

Descriptors: "Oil wastes, "Coal mine wastes, "Waste water treatment, "Water pollution sources, Oil well, Brine disposal, Secondary recovery (Oil), Injection, Strip mines, Mine acids, Mining.

Refinery classification, Transportation storage (Oil), Coal processing, Coal utilization. Drilling-production

The purpose was to evaluate pollution problems, abatement procedures, and control techniques relevant to the petroleum and coal industries. Petroleum wastes are discussed under three broad categories: (1) Drilling-Production, (2) Transportation and (3) Storage, and Refining, Within each section, petroleum wastes are identified as to their source, volume, and composition, and waste treatment methods are discussed. The results of a field study, delineating the characteristics of waste streams from individual processes within a refinery are reported. Coal mining, processing and utilization, the wastes associated with each, and the corresponding control measures are discussed. utilization, the wastes associated with each, and the corresponding control measures are discussed. Acid mine drainage, the most significant pollution problem from coal mining, is discussed. The principal pollutants generated from the processing of coal are suspended solids usually in the form of fine clay, black shale, and other minerals associated with coal. Coal is commonly used for the sociated with coal. Coal is commonly used for the production of coke. This process produces a waste high in phenols, ammonia, and dissolved organics. Waste characteristics and treatment efficiencies are tabulated and process and treatment schematic diagrams are presented. (EPA)
W73-06208

REVEGETATION AUGMENTATION BY REUSE

REVEGETATION AUGMENTATION BY BRUSE
OF TREATED ACTIVE SURFACE MINE
DRAINAGE - FEASIBILITY STUDY,
NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.
F. J. Zaval, and J. D. Robins.
Copy available from GPO Sup Doc as
EP1.23(2-72-119, \$2.00. Environmental Protection
Agency, Technology Series Report EPA-R2-72119, November 1972. 147 p, 20 fig., 24 tab, 4 ref,
append. EPA Project 14010 HNS (gr...at to Kentucky Dept. of Natural Resources).

Descriptors: "Acid mine drainage, "Neutraliza-tion, "Irrigation, "Limestones, Mine drainage, "Kentucky, Monitoring, Feasibility studies, "Vegetation regrowth, "Water reuse, Regulations, Legislation, Water quality standards.

The objective was to determine the feasibility of conducting a full-scale demonstration project on the use of neutralized acid mine drainage to irrigate new vegetative cover on regraded spoil banks. Two active surface mine sites in Kentucky were thoroughly evaluated for this purpose. It was

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determined that a site located in the Western Coal Field of Kentucky, near Madisonville, was the most suitable for implementation of the revegetation concept. Determination of project feasibility was based upon the performance and results of the following investigative measures: waters of receiving streams and pit discharges were analyzed and evaluated for treatment; regraded spoil banks were sampled and analyzed with respect to treatment and nutrient requirements necessary for vegetative survival; and weir structures, monitor enclosures and instruments were evaluated and selected for application in unattended installations. A flow diagram of a suitable limestone neutralization facility was developed. Four irrigation techniques were evaluated before a high pressure spray system was selected as the most practical means of delivering the treated drainage. Pertinent cost estimates were developed for the construction, installation and operation of the entire system at the selected demonstration site. (EPA) site. (EPA) W73-06209

ACID MINE DRAINAGE TREATMENT BY ION EXCHANGE, Culligan International Co., Northbrook, Ill.

Compan international Co., Northbrook, in. J. G. Holmes, and E. G. Kreusch.
Copy available from GPO Sup Doc as EPI.23/2:72-056, \$2.75. Environmental Protection Agency Technology Series Report EPA-R2-72-056, November 1972. 215 p, 30 fig, 97 tab, 3 ref, append. EPA Project 14010 FNJ. 14-12-887.

Descriptors: "Acid mine water, "Ion exchange, Pollution abatement, "Costs, "Mine drainage, Operating costs, "Waste water treatment. Identifiers: Water recovery.

Laboratory studies were conducted on synthetic acid mine drainage (AMD) using five ion exchange processes as follows: strong acid cation exchanger, hydrogen form; strong acid cation exchanger, sodium form; weak base anion exchanger, free base form; weak base anion exchanger, bicarbonate form; strong base anion exchanger, sulfate form. Studies in the first stage eliminated two resins from further work: strong base anion exchanger, sulfate form. The remaining three processes were studied additionally to establish fundamental design parameters for plants which can produce potable water from AMD. Two processes have resulted. These were used as the basis for design of plants in three sizes AMD. I wo processes have resulted. These were used as the basis for design of plants in three sizes (0.1, 0.5, and 1.0 MGD) of each process. Cost extimates have been developed for operation equipment (unassembled and unerected), and erection based on electrical and plumbing requirements. (EPA) W73-06211

A PRESSURE SEWER SYSTEM DEMONSTRA-TION,

Environmental Protection Agency, Washington, D.C.

D.C.
I. G. Carcich, L. J. Hetling, and R. P. Farrell.
Copy available from GPO Sup Doc as
EPI.23/2:72-091, \$2.75. Environmental Protection
Agency Technology Series Report EPA-R2-72091, November 1972. 218 p, 79 fig, 32 tab, 44 ref, 5
append. EPA Project 11022 DQI.

Descriptors: Sewers, *Pressure conduits, Pumps, Pumping, Plastic pipes, *New York, Sampling, Domestic wastes, Chemical analysis, Operating

Identifiers: *Grinder pumps, Pumping hydraulics, *Wastewater collection system, *Pressure sewer hydraulics, *Albany (NY).

A field demonstration of 12 Grinder Pump (GP) Units was performed for a 13 month period in Al-bany, New York. Continuous operational records were kept by means of an automatic monitoring

system. Pressures, water usage, operating time, overflow occurrences, total number of operations simultaneous operations were recorded for the duration of the project. The prototype GP Units registered an undesirably high number of maffunctions; loss of prime by pump, and grease clogging of pressure sensing tube. The new modified GP Units performed exceedingly well for the last 7 months of the demonstration and were not afficited by the aforementioned incidents. There was no visible wear and tear of the mechanical components of the units. The effectiveness of small, non-metallic pipes transporting the macerated wastewater under pressure was successfully demonstrated. Grease accumulation did occur and all of the results are pointing to a need for a careful hydraulic design. Extensive chemical sampling proved that the pressure sewer waste was 100% stronger but contained 50% less contaminants on a gm/capita/day basis. Settleability tests on the pressure sewer waste showed no significant differences over conventional wastewater. (EPA) W73-06213

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT, Iowa State Univ., Ames. Dept. of Agricultural En-

eering.
r primary bibliographic entry see Field 05G. W73-06214

HEAVY METALS REMOVAL IN WASTE-WATER TREATMENT PROCESSES: PART 2 -PILOT PLANT OPERATION. Orange County Water District, Santa Ana, Calif. D. G. Argo, and G. L. Culp. Water and Sewage Works, Vol. 119, No. 9, p 128-132, September 1972. 1 fig, 10 tab, 5 ref.

Descriptors: *Heavy metals, *Waste treatment, Adsorption, "Waste water treatment, "Sewage effluents, Arsenic, Cadmium, Chromium, Lead, Selenium, Mercury, Copper, Zinc, Filtration, Carbon, Separation techniques, Effluents, "Califor-

Identifiers: Removal, Barium, Silver, Charac-

terization.

The Orange County Water District pilot wastewater reclammation plant study was performed for the purpose of obtaining design data for a full-scale 15 mgd reclamation plant. The pilot plant treatment system of lime coagulation and settling, mixed media filtration and activated carbon adsorption was very effective in reducing the concentrations of cadmium, hexavakent chromium, zinc, and copper. This advanced wastewater treatment scheme also reduced the concentrations of the remaining heavy metals studied (arsenic, barium, lead, selenium, silver, and mercury) with varying degrees of success. Removal efficiency appeared to be dependent on influent concentration. The lower removals always occurred when influent concentrations were very low. The results indicate that certain heavy metals can be removed along with organics, suspended solids and other inorganics by lime coagulation, mixed media filtration and activated carbon adsorption. (Little-Batelle) telle) W73-06293

TREATMENT AND DISPOSAL OF CITRUS FRUIT PROCESSING WASTES, Montgomery (James M.) Consulting Engineers, Inc., Pasadena, Calif. R. J. TeKippe. Journal Water Pollution Control Federation, Vol. 44, No. 10, p 2001-2012, October 1972. 7 fig. 1 tab, 28 acf.

Descriptors: *Industrial wastes, *Food processing industry, *Citrus fruits, *Waste treatment, *Pollutant identification, Effluent streams, Activated sludge, Organic wastes, Organic acids, Hydrogen

ion concentration, Biochemical oxygen demand, Chemical oxygen demand, Waste water disposal. Identifiers: Citric acid.

The characteristics (BOD, COD, pH) of wastes from citrus fruit processing plants are presented, but the emphasis is on the theory and techniques of treating these wastes. The composite wasteris usually high in organic content, high in dissolved solids and suspended solids, and low in pH due to citric acids. Activated sludge treatment has been indicated as an effective oxidizer of the organic wastes. Waste streams high in organics and solids are disposed of by means of a non-reclaimable waste level while streams with low organics and solids are sent directly to the municipal sewer system. (Mackan-Battelle)

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CYANIDE REMOVAL FROM WASTE EF-

CYARDE RESERVANCE

FLURINTS,
Miles Labs., Inc., Eikhart, Ind. (assignee).
A. C. Lauria, and J. L. Owens.
U. S. Patent No. 3,697,421, 2 p, 8 ref; Official
Gazette of the United States Patent Office, Vol.
903, No. 2, p. 611, October 10, 1972.

Descriptors: "Patents, Metals, "Heavy metals, "Waste water treatment, "Chelation, Copper, Industrial wastes, Liquid wastes, "Chemical wastes, Pollution abatement, Water quality control, Water pollution control. Identifiers: "Cyanide, "Chemical treatment, Starch conversion syrup.

Cyanide compounds may be removed from waste effluent by converting such compounds to non-toxic materials. A starch conversion syrup is mixed with the effluent at a temperature of 18 deg C to about 100 deg C for about 15 minutes to about 4 hours. The waste effluent may also be treated with a metal chelating composition. Up to 98 percent of copper contamination can be removed. (Sinha-OEIS)
W73-06418

PROCESSES FOR THE PURIFICATION OF WASTE EFFLUENT,
Tasman Vaccine Lab. Ltd., Upper Hutt (New Zealand). (assignee).
R. A. Grant.
U. S. Patent No. 3,697,419, 3 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 611, October 10, 1972.

Descriptors: "Patents, Industrial wastes, "Proteins, "Liquid wastes, "Waste water treatment, "Ion exchange, Cationic exchange, Anionic exchange, Pollution abatement, Water quality control, Water pollution control. Identifiers: "Abattoir wastes.

Liquid wastes containing proteins are passed through a bed of a particulate ion exchange material in the form of a cross-linked regenerated cellulose modified by the introduction of cationic or anionic exchange groups. The material should be capable of taking up at least the major portion of the remaining protein from the effluent and subsequently regenerating the ion exchange material for use in a further cycle. (Sinha-OEIS)

HEAT TREATMENT OF SEWAGE SLUDGE, Sterling Drug Inc., New York. (assignee). G. H. Telletzke, P. V. Knopp, and A. H. Erickson. U. S. Patent No. 3,697,417, 4 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 610, October 10, 1972.

Descriptors: *Patents, Sewage sludge, *Color, *Biological oxygen demand, *Sewage treatment, Dewatering, Pollution abatement, Water quality control, Water pollution control, *Waste water

Preheated sewage sludge is briefly heated at a temperature between 190 deg C and about 230 deg C for up to 240 seconds. This is inversely proportional to the temperature to which the sludge is heated and sufficient to improve the dewatering characteristics of the sludge. Immediate cooling reduces color and BOD formation in the supernatual liquid. (Sinha-OEIS)

DEEP TANK AERATION USING EDUCTOR TUBES OF ELONGATE CROSS-SECTION, Chicago Bridge and Iron Co., Oak Brook, Ill. (as-signee). J. D. Walker.

U. S. Patent No. 3,696,029, 6 p. 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 903, No 1, p 278, October 3, 1972.

Descriptors: "Patents, "Waste water treatment, "Aeration, Equipment, Abatement, Pollution abatement, Water quality control, Water pollution control, Tubes. Identifiers: "Eductor tubes.

Eductor tubes are used for aeration in very deep tanks. Efficient use of tube cross-sections for huge volumes is achieved by using clongate cross-sections, such as rectangular tubes, with the tube favorably placed for setting up a double-roll of the tank contents effective for stirring a very large area of the tank. The eductor tube extends far enough above the air liberation level for the air to have completed its initial rapid expansion upon liberation. Roll-producing efficiency is achieved when a surface level baffle is used. (Sinha-OEIS) W73-06425

WASTE TREATMENT SYSTEMS.

U. S. Patent No. 3,695,439, 3 p, 3 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 903, No 1, p 151, October 3, 1972.

Descriptors: "Patents, "Waste water treatment, "Sewage treatment, "Aeration, Equipment, Abatement, Polition abatement, Water quality control, Water pollution control. Identifiers: "Water pollution prevention.

A cylindrical tank on a vertical axis has a conical bottom end. An inner cylinder is concentric with the tank. It has a source of air under pressure and an air diffuser. Air is delivered to the bottom of a vertical delivery line to where the fluid sewage is moved from the apex of the cone to the inlet line and mixed with incoming sewage. (Sinha-OEIS) W73-06426

CONTINUOUS PROCESS FOR SEPARATING

CONTINUOUS PRINCESS FUR SEFARATING OILY SLUDGES, Texaco Inc., New York. (assignee).

E. L. Cole, and H. V. Hess.
U. S. Patent No. 3,696,021, 4 p, 1 fig, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 903, No 1, p 276, October 3, 1972.

Descriptors: *Patents, Sludges, *Oil wastes, *Oil pollution, Oil industry, *Industrial wastes, *Sludge treatment, Abatement, Pollution abatement, Water pollution control, dater quality control, Treatment, Chemical oxygen demand, *Waste water treatment, Recycling.

A process for deoiling and dewatering sludges con-sists of mixing the sludges with light hydrocarbon sists of mixing the sludges with light hydrocarbon and allowing gravity separation to take place. Separate phases separate out as water having reduced COD, a solids-water phase, and an oil hydrocarbon phase. The oil hydrocarbon phase is heated to a temperature above the critical temperature of the hydrocarbons which may be recycled for mixing with additional sludge and the oil is recovered for further use. Eleven examples are cited. (Sinha-OEIS)

ABATEMENT OF WATER POLLUTION, J. M. A. Vander Horst. U. S. Patent No. 3,694,336, 2 p, 4 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1433, September 26, 1972.

Descriptors: "Patents, "Phosphates, Nutrient removal, "Acid mine water, Mine draimage, Mine acids, "Iron compounds, "Sewage treatment, Liquid wastes, "Industrial wastes, "Waste water treatment, Sewage, Metals, Heavy metals, Pollution abatement, Water quality, Water quality control, Water pollution control.

Phosphate is removed from sewage by mixing the sewage with acid mine drainage which contains dissolved iron salts. The ferrous ion in the acid mine drainage combines readily with the phosphate ion in the sewage to form insoluble iron phosphate. The liquid containing water insoluble iron phosphate can then be submitted to flocking treatment to promote precipitation. (Sinha-OEIS) W73-06429

EXTENDED AERATION WASTE WATER

TREATMENT, Hittman Associates, Inc., Columbia, Md. (as-

signee).
J. T. Yang, R. Waller, and C. W. Mallory.
U. S. Patent No. 3,694,353, 7 p, 9 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1435, September 26, 1972.

Descriptors: *Patents, *Liquid wastes, *Waste Descriptors: "ratellas, "cliqui wastes, "waste water treatment, "Aeration, Equipment, Sewage treatment, Abatement, Pollution abatement, Water pollution control, Water quality control. Identifiers: "Water pollution prevention.

The apparatus consists of a tank with planar baf-fles which define an aeration zone, a mixed liquor return zone and a clarifier zone. A compressed air source is located in a lower portion of the aeration zone. The position of the baffles and the flow rate zone. The position of the baffles and the flow rate of the compressed air are selected so that the mixed liquor vigorously recirculates through the tank at a minimum velocity at least 10 times the settling velocity of the sludge particles. The rapid flow rate of the mixed liquor insures that oxygen is always available to the bacteria, even when the sludge is not in an aeration zone. (Sinha-OEIS) W73-06430

RARE EARTH ION REMOVAL FROM WASTE

WATER, North American Rockwell Corp., Canoga Park, Calif. (assignee)
H. L. Recht, and M. Ghassemi

U. S. Patent No 3,692, 671, 5 p, 7 ref; Official Gazette of the United States Patent Office, Vol 902, No 3, p 1059, September 19, 1972.

Descriptors: "Patents, "Waste water treatment,
"Chemical precipitation, Phosphates, Sulphates,
"Carbonates, Municipal wastes, Abatement, Pollution abatement, Water quality control, Water
pollution control, "Filtration, Water quality,
Chemical precipitation, Industrial wastes.
Identifiers: "Rare earths, Lanthanum, "Chemical

A method is provided for chemically removing A memor is province to chemically removing trivalent rare earth ions from waste water by precipitating the rare earth ions with a carbonate ion. The carbonate ion may be provided by an al-kali metal carbonate such as sodium or potassium half metal carbonate such as sodium or potassium carbonate. The carbonate ions combine with the rare earth ions to form an insoluble rare earth car-bonate precipitate which is removed from the water by settling and filtration. The rare earth ions may be regenerated in the form of a soluble rare earth salt, such as lanthanum chloride or lanthanum sulfate, by treating the precipitate with acid. (Sinha-OEIS) W73-06435

APPARATUS FOR REMOVING POLLUTANTS AND IONS FROM LIQUIDS, Resource Control, Inc., West Haven, Conn. (as-

signee)
J. H. Shockcor.
U. S. Patent No 3,692,661, 3 p, 10 fig. 7 ref; Official Gazette of the United States Patent Office, Vol 902, No 3, p 1057, September 19, 1972.

Descriptors: "Patents, "Liquid wastes, "Ions, Metals, Electrical conductance, Direct current, Electrodes, Industrial wastes, Abatement, Pollution abatement, "Waste water treatment, Water quality control, Water pollution sources, Water pollution control, Treatment. Identifiers: "Electrochemical treatment.

A vessel is provided in which cathodes and anodes A vessel is provided in which cathodes and anodes are placed to form a number of cells. A bed of packing elements is placed in each cell and the cathodes and anodes connected to a direct current source. The cathodes and anodes form a baffle system which provides a circuitous flow path for liquid passing through the vessel. The treated liquid is collected in a final chamber where the quality of treated discharge may be monitored and/or adjusted before being disposed into a lake, stream or the ocean. (Sinha-OEIS)

METHOD FOR PRODUCING PURE WATER FROM SEA WATER AND OTHER SOLUTIONS BY FLASH VAPORIZATION AND CONDENSA-

For primary bibliographic entry see Field 03A. W73-06437

REMOVAL OF ORGANIC COLLOIDS BY

MICROFLOTATION, Clarkson Coll. of Technology, Potsdam, N.Y. E. A. Cassell, A. J. Rubin, H. B. LaFever, and E.

E. A. Cassell, A. J. Rubin, H. B. LaPever, and E. Matijevic.
For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402, Price \$0.35. Office of Saline Water Research and Development Progress Report No 758, March 1972. 23 p, 9 fig, 19 ref. 14-01-0001-1672.

Descriptors: "Flotation, "Foam separation, "Bacteria, Water pollution treatment, "Waste water treatment, Desalination, "Colloids, Hydrogen ion concentration.
Identifiers: *Microflotation, *Water renovation,
Bacteria removal, Aluminum nitrate, Lauric acid.

Studies were made to elucidate the conditions con Studies were made to entertake the condutions con-trolling efficient microflotation. Specifically, ef-fect of pH, aluminum salts and other coagulants or the foam separation by microflotation of several species of bacteria and materials which cause organic color in water were investigated. These studies have shown that microflotation is a nese studies have shown that microfiotation is a rapid, efficient, and non-selective technique for solid-liquid separation. Microfiotation may in some cases be advantageous, therefore, over gravity sedimentation. (See also W73-06450) (OSW Abstract)

HUMIC ACID REMOVAL BY MICROFLOTA-HUMIC ACID REMOVAL BY MICKOPLOTA-TION AND GRAVITY SETTLING, Clarkson Coll. of Technology, Potsdam, N.Y. T.D. Buzzell, and E. A. Cassell. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price 30.60. Office of Saline Water

Group 5D—Waste Treatment Processes

Research and Development Progress Report No. 757, March 1972. 59 p, 2 tab, 26 fig, 28 ref. 14-01-0001-1672.

Descriptors: "Flotation, "Foam separation, "Waste water treatment, "Humic acids, "Coagulation, Desalination, Color, Hydrogen ion concentration, Settling basins.

Identifiers: "Organic color removal, Microflota-

tion, *Gravity settling.

Following are the principal conclusions of this study: an Al (NO3)3 pH settling domain was established for a colloidal dispersion containing 50 mg/l humic acid; efficient removal of humic ac by microflotation occurs only when the humic acid is aggregated; removals by microflotation and set-tling occur over essentially the same conditions of pH and aluminum concentration for the humic acid system; the rate of clarification by settling is pH and alun acia system; the rate of ciarmication by setting is strongly dependent on the amount of floc or sludge produced; the clarification overflow rates for microflotation are from 5 to 13 times greater than settling overflow rates; and for settling, the thickening overflow rates are less than the clarifi-cation overflow rates and hence would control the design of a settling basin. (See also W73-06451)
(OSW abstract) W73-06450

THE MICROFLOTATION OF SILICA, Clarkson Coll. of Technology, Potsdam, N.Y. F. J. Mangravite, Jr., E. A. Cassell, and E. Matijevic.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Wshington, D.C. 20402 Price \$0.35. Office of Saline Water Research and Development Progress Report No 756, March 1972. 26 p, 9 fig, 31 ref. 14-01-0001-1672.

Descriptors: *Flotation, *Colloids, *Silica, *Waste water treatment, Hydrogen ion concentra-tion, Desalination.

Identifiers: *Microflotation, *Colloidal silica,

*Lauric acid, *Water renovation.

The microflotation of colloidal silica was carried out in the presence of aluminum salts at various pH values. The colloidal properties of the silicapay values. The contoinal properties of the silica-alumina system as a function of pH which are necessary for efficient separation by microflota-tion have been established and are discussed in detail. (See also W73-06452) (OSW abstract) W73-06451

STABILITY OF COLLOIDAL SILICA. IV. THE SILICA-ALUMINA SYSTEM, Clarkson Coll. of Technology, Potsdam, N.Y.

E. Matijevic, F. J. Mangravite, Jr., and E. A. Cossell

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.35. Office of Saline Water Research and Development Progress Report No 755, March 1972. 21 p. 7 fig. 30 ref.

Descriptors: *Waste water treatment, *Colloids, *Sälica, *Turbidity, Desalination, Hydrogen ion concentration, Aqueous solutions. Identifiers: *Colloidal silica, *Silica sols, *Aluum hydroxide, Metal ions,

Studies were made of the interactions of silica sols with soluble hydrolyzed metal ion species, particularly those of aluminum. The pH range over which aluminum hydroxide precipitation occurred was thoroughly investigated. The 'aluminum salt - pH' domain has now been expanded to include the sli-ica - alumina system. (See also W73-06449) (OSW abstract) W73-06452

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif. For primary bibliographic entry see Field 06D. W73-06454

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif. For primary bibliographic entry see Field 06D. W73-06455

SEWERAGE MANUAL, A GUIDE FOR THE PREPARATION OF APPLICATIONS, REPORTS

AND PANS.
Pennsylvania Dept. of Environmental Resources,
Harrisburg. Bureau of Water Quality Manage-

Publication No 1, 3rd Edition, March 15, 1972. 71

Descriptors: "Sewerage, "Sewage treatment, "Pennsylvania, "Water quality control, "State governments, "Sanitary engineering, Permits, Legal aspects, Standards, Design standards, Design criteria, Water quality standards, Domestic wastes, Industrial wastes, Water pollution control, Water pollution sources, Identifiers: "Guidelines.

The manual was prepared to serve as a guide to those persons responsible for the discharge of sewage to waters of the Commonwealth and for construction of sewers and sewage treatment sewage to waters of the Commonwealth and for construction of sewers and sewage treatment works in Pennsylvania. The guide is divided into three sections: (1) general information concerning the Acts of the Legislature and the structure of the Bureau of Water Quality Management, (2) the procedure for obtaining a discharge permit, and (3) the standards of the Commonwealth for sewerage facilities. Part three comprises the bulk of the report, and includes standards for sewerage and sewage treatment plants which are detailed and comprehensive. Included in part three are sections on: (1) engineering, (2) sewer design, (3) sewage pumping stations, (4) sewage treatment works, (5) sludge digestion and disposal, (6) secondary treatment, (7) disinfection and (8) waste stabilization ponds. The Bureau of Water Quality Management has responsibility for preserving and improving the punity of the waters of the Commonwealth for the protection of public health, animal and aquatifie, and for industrial comsumption and recreation. (Poertner)

FEASIBILITY OF UTILITY TUNNELS IN

URBAN AREAS, Chicago Dept. of Water and Sewers, Ill. For primary bibliographic entry see Field 08A. For primary W73-06462

WASTEWATER COLLECTION, TREATMENT AND DISPOSAL, MID-HUMBOLDT COUNTY URBAN FLANNING PROGRAM. Baruth and Yoder, Walnut Creek, Calif.

Available from the National Technical Informa-tion Service as PB-211 046, \$22.75 in paper copy, \$0.95 in microfiche. Humboldt County Planning Commission, Eureka, California, July 1971. 432 p, 59 fig, 88 tab, 13 ref. LPO-P/360-CAS-1.

Descriptors: *Long-term planning, *Sewage treatment, *Sewerage, *Sewage disposal, California, Land use, Forecasting, Water resources management, Waste water disposal, Waste water treatment, Future planning (Projected). Identifiers: *Mid-Humboldt County (California).

Planning of wastewater collection, treatment and disposal facilities for the period 1971 to 2020 is reported as one part of a four-part study for general land use policy and long-range plans for water, waste water and stormwater drainage facilities for Mid-Humboldt County, California. The study area covers 313 square miles and has a population of 74,000, this is expected to grow to 325,000 by 2020. The area was studied with respect to: physical features, land-use and population, wastewater characteristics, eixisting wastewater facilities, wastewater treatment and disposal requirements, alternative plans for future wastewater collection, treatment and disposal, and administrative and financial arrangements. Consideration of 3 alternative plans resulted in the recommendation of consolidation of all present systems into a single system in 1985. Secondary treatment is suggested, using the activated sludge method. Discharge of effluent to the ocean is recommended through a 2,000-foot long outfall sewer at depths of 20 to 30 feet. Prior to 1985, interim treatment facilities would need to be constructed. A detailed plan for recommended construction from 1972 to 1995 is given along with estimated costs. (Poertner)

WATER AND SEWER FACILITIES PLANNING PROGRAM, MADISON, ST. CLAIR AND MON-ROE COUNTIES, PHASE II, WATER AND SEWER SYSTEMS ANALYSIS. Southwestern Illinois Metropolitan Area Planning

Commission, Collinsville.
For primary bibliographic entry see Field 06F.
W73-06465

SWIRL CONCENTRATOR, J. P. Coombes.

Paper presented at American Public Works Association Annual Meeting, Minneapolis, Minnesota, September 24-29, 1972. 19 p.

Descriptors: *Combined sewers, *Water pollution Descriptors: "Combined sewers, "Water pollution control, "Sewerage, "Sewers, "Storm runoff, "Overflow, Sewage treatment, Water pollution sources, Water quality control, Domestic wastes, Drainage engineering, Mechanical control, Mechanical equipment. Identifiers: "Combined sewer overflows, "Swirl

Minimizing pollution from overflows of municipal combined sewer systems was researched. Esti-mates made in 1967 of the cost of separating com-bined sewers into separate storm and sanitary sewer systems are in excess of \$52 billion, nationwide. Investigations were made of a mechanical method for handling combined sewer overflows to method for handling combined sewer overflows to provide a less expensive alternative to the combined sewer pollution problem. The equipment is called a swirl concentrator. It is similar in operation to the air pollution cyclonic separator. Water enters through an inlet pipe, is slowed down and diffused with very little turbulence, causing the solids to settle rapidly over the full cross-section of the circular channel. A model test of a swirl concentrator was conducted, with a 3 cfs sanitary flow and a 3-vear frequency flow of 100 cfs. The flow and a 3-year frequency flow of 100 cfs. The swirl concentrator was 36 feet in diameter. Tests showed that it should remove 65 to 80 percent of floatables varying in size from 5 to 50 mm, 50 per-cent of grit of size 0.1 mm, 75 percent of grit of 0.2 mm, and about 80 to 100 percent of setteable solids larger than one millimeter. Potential applications of the swirl concentrator are not limited to controlling combined sewer overflows. It should be trolling combined sewer overflows. It should be useful in other separating processes, including pri-mary sewage treatment. Both cost and space requirements for swirl concentrators would be far less than for conventional treatment. (Poertner) W73-06468

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Informaticipal beville mick land u sidera develo ysis, p tion o econo also c and s SEPARATION OF COMBINED WASTEWATER AND STORM DRAINAGE SYSTEMS, SAN FRANCISCO STUDY AREA. Brown and Caldwell, Inc., San Francisco, Calif. For primary bibliographic entry see Field 08B.

AN ANALYSIS OF PITTSBURGH STORM INLET CAPACITIES AND SPACING REQUIRE-MENTS, Pittsburgh Urban Redevelopment Authority, Pa. For primary bibliographic entry see Field 08A. W73-06473

WATER AND SEWERAGE FACILITIES PLAN FOR THE GREATER COLUMBIA AREA. Central Midlands Regional Planning Council, Columbia, S.C.

ne 1971, 121 p, 33 fig, 3 ref, 1 append. HUD-S.C.-P-44.

Descriptors: *Water supply, *Sewerage, *Comprehensive planning, *Urbanization, Community development, Cities, City planning, Facilities, Projections, Water demand, Water treatment, Waste water treatment, Waste water treatment, Cooperation, Legislation, Water policy, *South Carolina, Legislation, Water policy, *South Carolina, *Implementation, Intergovernmental cooperation, Regional planning.

This comprehensive, areawide study presents plans for the water and sewer facility improvements needed to promote orderly and efficient growth and development of the Greater Columbia urban and urbanizing area. The plan inventories the existing facilities, projects the future needs, develops short and long-range improvements, and suggests a program of implementation. The following water and sewage facilities were judged according to their ability to meet present and future needs: raw water supply, treatment plants, storage facilities, distribution systems, sewage collection systems, sewage treatment facilities, and quality of receiving streams. Implementation of the proposed improvements for water and sewerage facilities will require: (1) substantial utility rate increases and Federal grant participation; (2) intergovernmental cooperation; (3) municipal policies regarding water and sewer services; (4) state regulations, legislation, and (5) establishment of a "Water and Sewer Planning and Coordinating Committee" within the Central Midlands Regional Planning Council. (Davis-Chicago) W73-06487

REGIONAL WATER AND SEWER GUIDE. Upper Savannah Planning and Development Dis-trict, Greenwood, S.C.

June 1972, 76 p, 7 fig, 21 tab, 21 ref, 2 append. HUD-S.C.-P-50.

Descriptors: "Water supply, "Sewerage, "Regional development, Projections, Water requirement, Facilities, Land use, Land development, Urbanization, Water policy, "South Carolina, Identifiers: "Greenwood (South Carolina), "Recional also assists Environmental accretion." gional planning, Environmental protection

Information is presented about the present and anticipated water and sewer facilities needs in Ab-beville, Edgefield, Greenwood, Laurens, McCor-mick and Saluda Counties. Goals, objectives and mick and Saluda Counties. Goals, objectives and land use development are part of the initial con-siderations for public water and sewer facility development in the region. Existing land use anal-ysis, physical constraints on land uses, identifica-tion of major land use generators, population and economic influences, and existing utilities were also considered in developing the region's water and sewer guide to the year 1990. Information about the region has been prepared in this form to permit widespread review and discussion of the implications regarding the future. Through knowledge and understanding of the forces affecting the area, it will be possible to make the necessary policy decisions required to guide the growth and development of water resources in the region while attempting to protect and conserve the environment. (Davis-Chicago) W73-06488

THE ST. LOUIS REGION WATER AND SEWERAGE FACILITIES,
East-West Gateway Coordinating Council, St. D. A. Sokol, A. G. Appell, T. L. Cover, and T. M.

Descriptors: "Water supply, "Sewerage, "Drainage, "Storm runoff, "Planning, Project planning, Programs, Long-term planning, Projections, Population, Sewage treatment, Water resources development, Water pollution control, Facilities, Illinois, "Missour, Identifiers: "Saint Louis metropolitan area, "Storm drainage, "Regional planning.

Results are presented of the Council's latest work aintaining an areawide water/sewer/storm age facilities planning program for the St. s Region. These efforts have produced a Louis Region. These efforts have produced a strong policy foundation organized in the form of a regional goal to focus the Council's direction in regional goal to focus the Council's direction in maintaining a planning program for water/sewer/storm drainage improvements over a long-range period, five specific objectives to be achieved in a shorter period of time, and 11 policies to be followed in the Region's effort to achieve its goal and objectives. Definitions of technical terminology, population projections by watershed, descriptions of various available methods of sewage treatment and analysis of the natural characteristics of the Region which provide problems and potentials for water resources development and water pollution abstement are invide problems and potentials for water resources development and water pollution abatement are in-cluded. Existing facilities for water supply, sanita-ry sewage treatment and storm drainage were analyzed in detail by sectors of the Region. Each sector was selected for this closer look based on the availability of data and the commonality of in-terests of the governmental jurisdictions involved. the two sectors in Missouri deal individually with the urbanized area located in the City of St. Louis and St. Louis County, and with the Class II Coun-ties of Franklin, Jefferson, and St. Charles. In Illinois, the tricounty Metro-East Sector includes Madison, Monroe and St. Clair Counties. All water and sewerage treatment facilities as small as those and severage treatment facinities as small as those serving a population of 100 people and larger were inventoried. This detailed inventory identifies the capacity and the level of quality of treatment. (Davis - Chicago)

W73-06491

COMPREHENSIVE SEWER AND WATER PLAN,
Mid Columbia Economic Development District
The Dalles, Oreg.
For primary bibliographic entry see Field 06B.
W73-06492

WATER AND WASTEWATER FUNCTIONAL PLANNING REPORT, FY 1972 South Carolina Appalachian Council of Governments. Greenville.

June 1972, 32 p, 7 tab, 3 ref. HUD-SC-04-00-0048.

Descriptors: "Water supply, "Sewerage, "Planning, Programs, Facilities, Project planning, Coordination, Community development, Regional development, Water supply development, Comprehensive planning, Efficiency, Waste water treatment, "South Carolina.

Identifiers: *Greenville (South Carolina), *Functional planning

The South Carolina Appalachian Council of Government's efforts in water and sewer functional planning for fiscal year 1972 are summarized. The needs for functional planning, the basis for programming of water and sewer facilities and the results of the years efforts are presented. Functional planning and programming is seen as an opportunity for the Council of Governments to become more active in certifying local needs, in coordinating the development of water and sewer systems, and in avoiding duplication of effort. Also it provides a chance to eliminate the fragmentation of water and sewer development that has occurred in the past and to streamline the delivery system for providing future services. Functional planning and programming is also a tool to be used in implementing other clements of the comprehensive planning program for the region. The basic goal for the water and sewer planning program is to develop the most cost effective wastewater treatment system possible. (Davis - Chicago)

SEWERAGE AND WATER SUPPLY PLAN FOR LACKAWANNA COUNTY. Lackawanna County Regional Planning Commis-sion, Scranton, Pa.

August, 1971, 158 p, 95 fig.

Descriptors: "Water supply, "Sewerage, "City planning, Water demand, Projections, Water supply development, Urbanization, Community development, Groundwater, Water Facilities, *Pennsylvania. Identifiers: *Scranton (Penn), *Sewage systems, *Water distribution systems.

Existing needs are determined, future needs are projected, and recommendations for the development of sewer and water facilities are set forth to meet these needs. By 1980, sewage collection systems will be needed in 35 of Lackawanna County's 40 municipalities. A total of 22 sewage treatment plants will be needed to provide treatment. Five additional plants will be needed by 1990. Wherever possible, the Plan recommends that communities work identify together in the that communities work jointly together in the planning and construction of sewage facilities. Currently, public water facilities are limited to the Currenlly, public water facilities are limited to the more urbanized communities of the County. As new development occurs in many of the rural communities, water supplies will be required in those areas also. By 1980, public water supply systems are planned within a total of 35 of the County's municipalities. Involved will be the development of totally new systems within rural communities and the extension of existing systems in urban areas. Wells will probably be the major water supply source in rural areas and surface supplies elsewhere. (Davis - Chicago) W73-06494

VOLUME IV-INVENTORY AND ANALYSIS OF EXISTING WATER SUPPLY SYSTEMS AND POTENTIAL SOURCES OF SUPPLY.
Malcolm Pirnie, Inc., White Plains, N.Y.
For primary bibliographic entry see Field 03D.
W73-06495

REGIONAL PLAN FOR S DRAINAGE, AND WATER SUPPLY.

Report prepared for the Greater Bridgeport Regional Planning Agency, Trumbull, Conr March, 1970, 59 p, 11 fig, 47 tab, 4 append.

Descriptors: *Sewerage, *Water supply, *Drainage, *Regional development, Future

Group 5D—Waste Treatment Processes

planning (Projected), Coordination, Drainage systems, Storm runoff, Industrial wastes, Cost analysis, Financing, Waste water treatment, Tidal waters, *Connecticut. Identifiers: *Bridgeport (Conn.), *Regional planning, Inter-municipal agreements, Tidal flood protection.

A plan is presented to guide the development of sewerage, drainage, and water facilities within the Greater Bridgeport region through the year 2020. Areas requiring sewers, sizes of new and parallel trunk sewers, and improvements to treatment plants are defined, along with a schedule for their construction. Inter-municipal agreements are recommended, allowing all sewage from Trumbull, Monroe, and later, Easton and northeast Fairfield to be treated in Bridgeport's West Side Treatment Plant on Long Island Sound. The need for enforcing a sewer code which limits industrial wastes, combating excessive infiltration, and eliminating combined storm-sanitary systems is stressed. The annual costs to construct and operate proposed sewerage facilities are developed in conjunction with anticipated grants. Criteria for adequate storm drainage systems are discussed, minimum channel dimensions are recommended for existing streams and drainage structures. The Army's plans for tidal flood protection are also noted. The adequacy of the existing private regional water company to meet projected water needs is examined and verified. (Davis-Chicago) W73-06496

ERIE COUNTY PUBLIC UTILITIES STUDY.
Erie County Metropolitan Planning Commission.

June 1970, 54 p, 32 map, 10 ref.

Descriptors: "Water resources development, "Public utilities, "Water supply, "Sewerage, "Coordination, Programs, Formulation, Land use, Population, Community development, Facilities, Waste water treatment, "Pennsylvania. Identifiers: "Eric (Penn).

The study is divided into five sections: Introduction, Background Data, Water, Sewers, and Coordination and Implementation. It attempts to lay the groundwork for a rational approach to the ultimate provision of a proper and adequate cycling of the water resources of Eric County, Pennsylvania. An overview of the basic data required to properly formulate an effective public utilities program's provided. Data cover population, land use, density of development, topographic features, hydrographic features, and soil types and suitability. The study outlines the adequacy of the existing water systems servicing the residents of Eric County and proposes a series of recommendations for the ultimate provision of an effective water supply system for the residents of Eric County has for the thasis for a sound water system and that this basic System properly developed and planned can continue to act as an impetus to the further growth of the County. The study investigates the sewer systems in Eric County and formulates a basic program for the upgrading of these systems and the provision for new systems in order to adequately provide for the treatment of wastewater in Eric County. The final section, Coordination and Implementation, offers an outline of a procedure which would establish programs for areawide water and sewer facilities. (Davis - Chicago)

COMPREHENSIVE WATER AND SEWER PLAN. SHREVEPORT STANDARD METROPOLITAN STATISTICAL AREA, CAD-DO-BOSSIER PARISHES, LOUISLANA. Demopolus and Ferguson, Inc., Shreveport, La.

Report prepared for the Caddo-Bossier Council of Local Governments, October 1, 1972. 155 p, 75 fig.

Descriptors: "Municipal water, "Municipal wates, "Water supply, "Sewerage, "Future planning (Projected), Planning, Management, "Louisiana, Urbanization, Land use, Public utilities, Water resources. Identifiers: *Shreveport (Louisiana).

The main purpose is to give a description of the water and sewerage facilities within the Shreveport Metropolitan Statistical Area and also the projected need for expansions and additions within a five year period and a twenty year period. Also included are descriptions of economic conditions in the areas surveyed, public utilities, natural resources, transportation, agricultural production, land patterns and trends, and water resources. Topographical, soil, and land use maps are also included. (Davis-Chicago) W73-06500

5E. Ultimate Disposal of Wastes

EXAMPLES OF THE APPLICATION OF SOILS MECHANICS TO WATER PLANT CONSTRUC-TION, Saint Louis County Water Co., University City,

For primary bibliographic entry see Field 08D. W73-05952

PUTTING INDUSTRIAL SLUDGES IN PLACE.

Environmental Science and Technology, Vol 6, No. 10, p 874-875, October 1972.

Descriptors: "Sludge disposal, "Waste disposal, "Ultimate disposal, Chemical wastes, Industrial wastes, Construction materials, Construction, Aggregates, Fly sah, Lime.

A mixture of fly ash and industrial by-product sludge with hydrated lime, cured at ambient temperatures has been patented by the G. and W.H. Corson Co. as a solution to the sludge disposal problem. Not only is the sludge disposal problem solved, but the encapsulated waste material is put to good use as road bed material or construction material that is sanitary and non-leachable, or construction aggregate which meets ASTM standards. International Utilities Corporation has acquired the Corson Co. and intends to contract the process to firms with waste disposal problems. (Smith-Texas) Texas) W73-06068

SEWAGE DISPOSAL STUDY TESTS SLUDGE ON CROPS. For primary bibliographic entry see Field 05D. W73-06069

SOLID WASTE DISPOSAL. For primary bibliographic entry see Field 06E. W73-06130

LAND RECLAMATION, A RECYCLE PROGRAM WHICH COMPLETELY SOLVES THE SEWAGE SOLIDS PROBLEM, Metropolitan Sanitary District of Greater Chicago,

F. E. Dalton, and R. R. Murphy.
Paper delivered at the Water Pollution Control
Fedration Annual Conference, Atlanta, Georgia,
October 9, 1972. 33 p., 28 fig., 1 ab.

Descriptors: "Water conservation, "Land management, "Waste disposal, "Land reclamation, "Sludge disposal, "Fertilization, Illinois, Municipal wastes, Industrial wastes, Sludge treatment, Sewage sludge, Sewage treatment, Solid

wastes, Sewage effluents, Disposal, Economics, Operating costs, Sanitary engineering. Identifiers: *Chicago, *Cook County.

Operating costs, Sanitary engineering.
Identifiers: 'Chicago, 'Cook County.

The Metropolitan Sanitary District of Greater Chicago serves Cook County including the City of Chicago and 116 adjacent suburban communities with a total area of about 860 square miles and a total population of 5.5 million people. Also handled is an industrial wastewater load equivalent to 4.5 million people. The total flow averages about 1.5 billion gallons a day. In removing an estimated \$20 dry tons of organic solids daily, the District has had a serious problem of disposal of the solids, and the treated effluent. The search for a system to handle the solids and the water led to development of a land reclamation system. Criteria which led to this choice included: (1) the opportunity to conserve and use the water and the solids, (2) the compatibility of the system with both rural and urban environmental standards, (3) the perpetuality of this solution, and (4) economics. After an extensive testing program, Fulton County, Illinois was chosen as the site for the Land Reclamation Program, called 'The Prairie Plan'. Development of the 70,000 acre site (28,000 acres usuable) is planned to avoid problems of pollution, provide for the use of the valuable resources in sewage effluent, and provide for multiple uses of the effluent. An extensive inventory of the area was set up for measuring the effects of the program on the local soil and water. The wet solids are currently transported by barge on the Illinois River, but in the future will be piped, reducing transportation costs by 70 percent. An important part of this project has been the public relations aspects. (Poertner') W73-06461 (Poertner) W73-06461

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5F. Water Treatment and **Ouality Alteration**

SOME METHODOLOGICAL APPROACHES TO THE HYGIENIC STUDY OF TRACE ELE-MENTS IN DRINKING WATER, (IN RUSSIAN), For primary bibliographic entry see Field 05A. W73-03872.

HYDROGEN SULPHIDE REMOVAL FROM

MELL WATER, Ohio State Univ., Columbus. M. L. Palmer. Ohio Agricultural Engineering, Extension Bulletin, Soil and Water No. 2, Revised, September, 1968. 2 p.

Descriptors: Water wells, *Domestic water, *Hydrogen sulfide, Chlorination, Manganese, Fil-tration, Aeration, Water quality, Oxidation, *Water treatment, Equipment, Iron bacteria, Water analysis.

Identifiers: *Hydrogen sulfide removal, Green-

The removal of hydrogen sulfide, formed by a bacteria present in ground water from organic matter or from sulfates, sulfides and sulfur itself, is described. The importance of having a good water nanlysis made by a supplier of water treatment equipment or a commercial water testing laboratory before purchasing hydrogen sulfide removal equipment is emphasized, in order to determine other water characteristics such as iron content, pH and hardness that may influence the type of equipment to be used. Types or mechanisms of hydrogen sulfide removal described are: (1) Chlorination, followed by filtration; (2) Manganese greensand filters; (3) Aeration. Advantages and disadvantages of each are discussed, with the chlorination/filtration method being the most generally recommended. Tips for purchasing hydrogen sulfide removal equipment are included. Rental, as an alternative method of obtaining

WATER QUALITY MANAGEMENT AND PROTECTION-Field 05

Water Treatment and Quality Alteration—Group 5F

hydrogen sulfide removal equipment, is mentioned. The situation of hydrogen sulfide occurring only in hot water is discussed, and methods of curing this problem are suggested. (Campbell-NWWA) W73-05901

CHLORINATING FARM AND HOME WATER SUPPLIES.

SUPPLIES, Ohio State Univ., Columbus.

Ohio State Univ., Columbus.
M. L. Palmer.
Ohio Agricultural Engineering, Extension Bulletin, Soil and Water No. 5, Revised, September, 1968. 2p.

Descriptors: *Chlorination, Chlorine, Disinfection, Domestic water, Cisterns, Dug wells, *Water treatment, Water wells, *Bacteria, Bacteria, Storage Spacetra, Water sources, Bolling, Iron bacteria, Diseases, Domestic water. Identifiers: Bleach (Laundry), Contamination, *Chlorine residual, Superchlorination, *Shock chlorination.

The disinfection of domestic water supplies by means of chlorination is explained. Advantages of chlorine as a disinfectant are discussed: ready availability, convenience, safety, simplicity, and ease of maintenance. It is noted that, since the available contact time for chlorination of private water supplies may be only 1 to 5 minutes, superchlorination, or the maintenance of a 3 to 5 mg/l chlorine residual, may be necessary. A step-by-step method for shock chlorination of the water source and entire water system is given. Shock chlorination is recommended following new well construction, pump installation or any time the water system is opened for repair. Procedures for emergency water disinfection are discussed; these include vigorous boiling for 2 minutes or the addition of laundry chlorine bleach at the ratio of 10 drops/gallon or 2 cups/1000 gallons of water. It is emphasized that the odor of free chlorine from water is a sign of safety. (Campbell-NWWA)

IRON REMOVAL FROM WELL WATER, Ohio State Univ., Columbus. M. L. Palmer. Ohio Agricultural Engineering Extension Bulletin, Soil and Water No. 3, Revised, September, 1968. 2

Descriptors: "Water treatment, Equipment, "Chlorination, Water wells, "Domestic water, Aeration, Manganese, Filtration, Oxidation, Iron bacteria, Water analysis, Calcium carbonate, Iron, Iron oxides, Hydrogen ion concentration. Identifiers: Greensand filters, Sodium carbonate.

The removal of iron from domestic water supplies is explained. Iron is shown to create problems both by its presence in the ferric and ferrous states and by providing an environment for the growth of iron bacteria. A laboratory analysis of the water to be treated for excess iron is recommended, in order to determine the quantity and type of iron in the water as well as other characteristics such as hardness and pH that may influence the type of iron removal equipment to be used. Types of iron removal equipment discussed are: (1) Chlorination, followed by filtration; (2) Manganese greenand filtration; (3) Water softening; (4) Aeration, followed by filtration or settling. Combinations of the above treatment systems are also discussed; advantages and disadvantages of each system are noted, with chlorination followed by filtration being the most generally recommended method. Tips for purchasing iron removal equipment are given, with rental suggested as an alternative to buying such equipment. An air-water separator is recommended where the water contains ferrous iron, to prevent the iron from being oxidized to ferric iron before the water reaches the iron removal equipment. (Smith-NWWA)

TREATING FARMSTEAD AND RURAL HOME WATER SYSTEMS. Agricultural Research Service, Washington, D.C.

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.10. Farmers' Bulletin No 2248, U.S. Department of Agriculture, Washington, D.C., January 1972. 15 p, 4 fig.

Descriptors: *Water treatment, *Water softening, *Chlorination, Iron, Hydrogen sulfide, Turbidity, Acidic water, Corrosion control, Hardness (Water), Calcium carbonate, Magnesium carbonate, E. coli, Chemical analysis, Hydrogen ion concentration, Rural areas, Domestic water.

Identifiers: Presumptive test, *Bacteriological

Processes for the testing and treatment of private water supplies are given. The bacteriological test for fecal coliform is explained, along with chemical testing for calcium, magnesium, iron, dissolved gases, and suspended solids. A procedure for taking an uncontaminated water sample for laboratory testing is outlined in detail. Chlorination, as a method of disinfection and sulfur removal, is recommended; the action of chlorine in water is shown, and various methods of chlorinating water supplies are given, including the use of positive-displacement, suction, aspirator, and tablet chlorination systems. The concept of contact time in disinfecting water supplies with chlorine is explained, along with the operation of chlorinators. Other disinfection methods, such as boiling, Pasteurization, ultra-violet light and ozonation, are covered along with the advantages and disadvantages of each. Water softening, iron removal neutralization of acid water, elimination of objectionable tastes and odors, and turbidity control are other aspects of water treatment discussed in detail. (Smith-NWWA)

GEOTHERMAL RESOURCE INVESTIGA-TIONS, Bureau of Reclamation, Boulder City, Nev. Region 3. For primary bibliographic entry see Field 03B. W73-05943

FERMENTATION INDUSTRY - PHARMACEU-TICALS, CORN, SUGAR, Oklahoma State Univ., Stillwater. For primary bibliographic entry see Field 05B. W73-06010

CONCENTRATION OF TRACE ORGANIC CONTAMINANTS FROM AQUEOUS SOLU-TION BY FREEZING, Pittsburgh Univ., Pa. For primary bibliographic entry see Field 05D. W73-06058

BIOLOGICALLY MEDIATED CHEMICAL CHANGES IN THE FILTRATION OF AERATED GROUND WATERS, Illinois Univ., Urbans.

Illinois Univ., Urbana.
K. Y. Baliga.
Available from University Microfilms 300 N. Zeeb
Rd. Ann Arbor, MI 48106, Order No. 70-13,239,
Xerox copy 98.00, Microfilm \$4.00. Ph. D. Dissertation, 1969. 171 p.

Descriptors: *Filtration, *Aeration, Chlorine, Ammonia, *Illinois, Iron compounds, *Water treatment, Filot plants, Potassium, Oxidation, Dissolved oxygen, Nitrification, Cost comparisons, Filters.

Legnifiers: *Aerated groundwaters. *Iron

Identifiers: *Aerated groundwaters, *Iron removal, *Permanganate, Rantoul, Urbana, Nitrifying bacteria, Mudball formation.

Research was undertaken to detect the chemical changes taking place in ground water supplies during filtration due to biologic activity and also to test practical methods of bacterial growth control within the filters. Pilot plant studies were conducted for five months at Rantoul and for ten months at Urbana, Illianis for removal of iron in the treatment of aerated ground water. Although a solution of potassium permanganate was effective longer than a chlorine solution, the cost of the chlorine treatment was less than that for potassium permanganate treatment. (Gottschalk-Texas) W73-06060

WATER TREATMENT APPARATUS, For primary bibliographic entry see Field 05D. W73-06146

WATER SOFTENER SYSTEM, Ecodyne Corp., St. Paul, Minn. (assignee). E. J. Tischler. U. S. Patent No. 3,687,289, 7 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 901, No 5, p 1656, August 29, 1972.

Descriptors: *Patents, *Water softening, *Brines, Equipment, Separation techniques, *Water treatment, *Ion exchange.

A metering device is provided by which the water used to prepare a saturated brine solution to regenerate an ion exchange water softening material is metered into a brine generating tank in fixed predetermined proportion to the amount of water softened. Regeneration is dependent upon the amount of water softened. (Sinha-OEIS) W73-06152

FRUIT-, VEGETABLE-, AND GRAIN-PROCESSING WASTES, CH2M/Hill, Corvallis, Oreg. G. A. Richter, and M. R. Soderquist. Journal Water Pollution Control Federation, Vol. 44, No. 6, p 1037-1043, June 1972. 85 ref.

Descriptors: "Reviews, "Food processing industry, "Waste treatment, "Fruit crops, "Grains (Crops), "Vegetable crops, Industrial wastes, Reverse oamosis, Filtration, Aeration, Flocation, Biological treatment, Trickling filters, Hydrogen ion concentration, Biochemical oxygen demans, Fungi, Oxidation lagoons, Sludge treatment, Mist irrigation.

A literature review is presented on fruit-, vegetable-, and grain-processing wastes and methods for their treatment. The treatment methods include aeration lagoons, spray irrigation, oxidation ditches, and various sludge concentration techniques. (Mackan-Battelle)

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif. For primary bibliographic entry see Field 06D. W73-06454

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif. For primary bibliographic entry see Field 06D. W73-06459.

FEASIBILITY OF UTILITY TUNNELS IN URBAN AREAS, Chicago Dept. of Water and Sewers, Ill. For primary bibliographic entry see Field 08A. W73-06462

Group 5F-Water Treatment and Quality Alteration

WATER AND SEWER FACILITIES PLANNING PROGRAM, MADISON, ST. CLAIR AND MONROE COUNTIES, PHASE II, WATER AND SEWER SYSTEMS ANALYSIS.
Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.
For primary bibliographic entry see Field 06F.
W73-06463

CONTROLS FOR A SMALL WATER UTILITY, American Water Works Service, Co., Inc., Had-donfield, N.J.

Paper presented at the American Water Works Association Annual Conference, Denver, Colorado, June 13-18, 1971. 16 p, 8 fig.

Descriptors: *Water supply, *Instrumentation, *Remote control, *Remote sensing, Water measurement, Control systems, Automatic control, Gages, Water level recorders, Distribution systems, Water pressure, Water levels, Public utilities.

Identifiers: Small utilities, Pressure sensors, Water distribution.

The typical small water company usually has a small staff and many sources of water supply which are geographically isolated and unattended. Automation and central control of many everyday functions can greatley assist such an operator. This paper discusses the instrumentation that is now available and utilized by the small water utilities. Vital to any water utility is knowledge of the level of water in an elevated tank along with the nature of the change in the level. Instrumentation to remotely measure the water level using a level transmitter, a telephone cable pair and a recorder will cost about \$750. For an extra \$100, controls can be purchased to turn on and shut off a pump to maintain proper levels. An automatic system can be used to measure pressure remotely and activate pumps at a \$150 cost, or less. To provide pressure for end-of-the-line users, or to overcome unusual pumps at a \$150 cost, or less. To provide pressure for end-of-the-line users, or to overcome unusual ground contours, a hydropneumatic system cost-ing \$150 can be used. It would consist of a small booster pump. compressor, and a pressurized ing \$150 can be used. It would consist of a small booster pump, compressor, and a pressurized tank. Well pump interlocks, to provide for automatic chlorination of well water, will cost less than \$50. Pressure reducing valves, to reduce the pressure during off peak hours to parts of the water system, can be automatically controlled by a time clock to pre-set hours and pressures and flowrates. Manual pump control from a central location will eliminate travel to each site to start the pumps. This would cost about \$1,500 per pump. Security is a very important consideration for isolated facilities and many systems are available. (Poertner) W73-06466

5G. Water Quality Control

DETERGENTS IN WATER HYGIENE AND SANITARY PROTECTION OF WATER RESER-VOIRS, (IN RUSSIAN), For primary bibliographic entry see Field 05C. W73-05900

THE ROLE OF GROUND WATER IN THE NA-TIONAL WATER SITUATION, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 04B. W73-05904

THE EFFECT OF TREATING SMALL RIVERS OF THE WESTERN POLESYE WITH INSECTICIDES (DURING CONTROL OF BLOOD SUCKING FLIES) ON THEIR HYDROBIOLOGICAL REGIME (IN RUSSIAN), For primary bibliographic entry see Field 05C. W73-05928

WASTEWATER MANAGEMENT STUDIES BY THE CORPS OF ENGINEERS, Office of the Chief of Engineers (Army), Washing-ton, D.C.

ary bibliographic entry see Field 05D.

ECOLOGICAL BENEFITS OF HYDRAULIC DREDGING, Ellicott Machine Corp., Baltimore, Md. For primary bibliographic entry see Field 08C.

INVESTIGATION OF THE EFFECTS OF SANI-INVESTIGATION OF THE EFFECTS OF SANI-TARY LANDFILLS IN COAL STRIP MINES ON GROUND WATER QUALITY, Martin (A. W.) Associates, King of Prussia, Pa. For primary bibliographic entry see Field 03C. W73-05953

EFFECTS OF COAL MINING ON THE WATER RESOURCES OF THE TRADEWATER RIVER BASIN, KENTUCKY, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 05B. W73-05981

COAL AND COAL MINE DRAINAGE, Bituminous Coal Research Inc., Pittsburgh, Pa. J. F. Boyer, and V. E. Gleason. Journal Water Pollution Control Federation, Vol 44, No 6, p 1083-1093, June 1972. 52 ref.

Descriptors: "Water quality control, "Mine drainage, "Coal mines, "Waste water (Pollution), "Water pollution sources, "Water pollution effects, "Coal mine wastes, "Strip mine wastes, Strip mines, Reclamation, Acid mine water, Thiobacillus ferrooxidans, Pyrite, Inorganic compounds, Methodology, Reviews, Biological treatment, Model studies, Oxidation, Chemical reactions, Mine acids.

Identifiers: Chemical treatment.

A literature review is presented of studies on coal and coal mine drainage. The studies cover (1) pyrite oxidation, (2) acid mine drainage, (3) acid production, (4) hydrologic effects of mining, (5) waste treatment, and (6) reclamation. (Holoman-Pettello) Battelle) W73-06006

INCORPORATION OF NEW POLLUTION CON-TROL TECHNOLOGY IN PROCESS DESIGN AND CONTROL, Weston (Roy F.), Inc., West Chester, Pa.

R. F. Weste Water and Sewage Works, Vol 119, No 8, p R-140/R-148, August, 1972. 4 fig, 21 ref.

Descriptors: "Pollution abatement, Technology, "Water quality control, "Sewage treatment, "Waste water treatment, Industrial wastes, Mu-nicipal wastes, Cost analysis, Cost comparisons, Combined sewers, "Design criteria, "Design stan-dards, Projections, Dissolved oxygen. Identifiers: "Pollution control technology.

Factors are summarized that should be considered in introducing new pollution control technology in process design and control. Illustrations are given of the approach taken to incorporate new technology. Some of the factors to be considered in introducing new pollution control technology are: (1) complete and precise definition of the problem, (2) acquiring a basic understanding of the new technology, and (3) evaluating the alternatives. Other factors to be considered are: (1) variations in natural phenomena such as streamflow and temperature, and (2) an economic evaluation of the technique to be utilized. Examples of introducing new technology include paper mill ef-

fluent, petrochemica wastes. (Smith-Texas) W73-06045 ical wastes and

A LEAST-COST ANALYSIS FOR HOUSTON SHIP CHANNEL,
Texas Univ., Austin.
For primary bibliographic entry see Field 05B. THE A sho to fre 27 till his les an will ke the sur dist Te W

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CLRAN WATER THROUGH DREDGING, Blicott Machine Corp., Baltimore, Md. A. H. Sorensen. Water and Sewage Works, Vol 119, No. 8, p R-149-R-150, August, 1972.

Descriptors: Water pollution, "Water pollution sources, "Water quality control, "Dredging, Sedimentation, Erosion, Water pollution control.

The dredge industry should be considered the solution to the largest cause of pollution, which is sedimentation and erosion. Furthermore, dredgin of estuaries, wetlands, rivers, oceans, beaches an lakes, must have the factor of time on its side (Smith-Texas)

W73-06066

THE PRESENT AND FUTURE ROLE OF IN-STRUMENTATION IN WATER POLLUTION CONTROL,

CONTROL, J. F. Drake. Effluent and Water Treatment Journal, Vol 12, No 4, p 181-193, April 1972. 6 tab, 20 ref.

Descriptors: *Instrumentation, *Automation, Treatment facilities, Waste water treatment, Waste treatment, Waste treatment, Suspended solids, Temperature, Water pollution control, Water quality control, *Monitoring, Pollution abstement. Identifiers: *Water pollution instrumentation.

Identifiers: "Water pollution instrumentation. Several basic questions concerning instrumentation in water pollution control are: (1) what are instruments required to do., (2) what is the nature and extent of current demand for water pollution instrumentation., (3) what instruments are currently available., (4) how will the pattern and scale of instrument usage alter in the future and (5) in what way will instrumentation develop to keep pace with these changes. The main concern with what instruments are required to do is the measurement of chemical species and other physical measurements such as the amounts of suspended solids and temperature that are found in wastewater. Tables show statistically the nature and extent of current demand for water pollution instrumentation and other tables show the number of instruments that are currently available in the United Kingdom. The number of reliable monitors for individual substances has not kept pace with the diversity of new pollutants. It is hoped that research and development on automatic control systems will increase. (Smith-Texas)

COMPUTATIONAL RESULTS FOR WATER POLLUTION TAXATION USING MULTILEVEL APPROACH, APPROACH,
Case Western Reserve Univ., Cleveland, Ohio.
Systems Research Center.
Y. Y. Haimes, J. Foley, and W. Yu.
Water Resources Bulletin, American Water
Resources Association, Vol 8, No 4, p 761-772,
August 1972. 3 fig, 2 tab, 13 ref.

Descriptors: *Pollution taxes (Charges), Waste treatment, Waste water treatment, *Cost analysis, *Water quality control, *Water pollution control, Biochemical oxygen demand, Model studies, Mathematical models, Optimization, Theoretical analysis, Water pollution sources.

Identifiers: Multilevel mathematical approach.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

A regional authority was postulated as a pollution abatement agency with the task of minimizing the total cost of waste treatment to the region. Data from the Miami River in Ohio are used to model a 27 reach river with 15 BOD dischargers. The multilevel approach with a 2 level optimization hierarchy is applied to the river system. At the first level each subsystem is independently optimized, and at the second level the subsystems solutions are coordinated to yield an overall optimum to the whole region. The initial level approach assumes a knowledge of the local treatment cost functions by the regional authority while the other approach assumes no such knowledge. Computational results are presented to complement the theoretical discussions on the multilevel approach. (Smith-WTLM972)

NIAGARA RIVER ENVIRONMENTAL PLAN, SUMMARY REPORT. Erie and Niagara Counties Regional Planning Board, Grand Island, N.Y. For primary bibliographic entry see Field 06B. W73-06078

WASTE WATER MANAGEMENT POLICY STATEMENT, MASON COUNTY, MICHIGAN. Mason County Planning Commission, Mich.

January 1972, 9 p.

Descriptors: Waste water treatment, "Management, "Water policy, "Community development, Recreation, Tourism, Employment opportunities, Political aspects, Regional planning, Financing, Recycling, Water reuse, Solid wastes, Water spreading, "Michigan. Identifiers: "Waste water management, Financial equity, Political equity."

This policy statement contends that waste water management is directly related to community development and improvement. A number of goals and objectives are discussed in the following areas: job expansion; industrial expansion; recreation tourism and the service industry; agriculture; environment and the economy; housing, education, public services and systems efficiency, and functional consolidation of services. Using these goals and objectives as a base, a series of wasterwater management goals and objectives are outlined as a basis for policy: (1) political equity; (2) financial equity; (3) a regional approach to management; (4) maximum reclamation and reuse of the water resources, (5) consolidation of solid waste and wastewater treatment facilities and (6) the use of land disposal for wastewater treatment effluent. (Davis-Chicago) W73-06087

WATER, MAN, AND NATURE, A SYMPOSIUM CONCERNING THE ECOLOGICAL IMPACT OF WATER RESOURCE DEVELOPMENT. Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 06G. W7J-06088

PRIVATE RELIEF UNDER THE REFUSE ACT, H. J. Lazarus. Environmental Affairs, Vol 2, No 1, p 250-270, Spring 1972. 114 ref.

Descriptors: "Navigation, "Water pollution control, "Legal aspects, Regulation, Federal government, Discharge measurement, Water law. Identifiers: "Refuse Act (1970), "Private relief, Litisation."

Problems facing private parties who seek injunctions against unauthorized discharges into navigable waterways, under the federal Refuse Act (1970) are discussed. The Act's primary purpose is to prevent obstructions to navigation and/or pollu-

tion. These problems are tripartite, relating to: the purpose and scope of the Act, the remedies generally available under the Act, and the standing of private persons to litigate with respect to violations of the Act. Historically, ittigation by private plaintiffs under the Refuse Act has been unavailing. There is a discernible trend, however, to regard private litigation under the Act as being consonant with the Act's purposes. It is no longer accepted by the courts that the Refuse Act applies only to activity which impedes naviagion. The availability of injunctive relief for violations of the Refuse Act has now been firmly established. So far the only successful plaintiff in this regard has been the federal government, although the same policy arguments could be used with equal force by a private plaintiff. The act admits of claims and remedies not only to navigational interference, but also to pollution activity. (Strachan-Chicago) W73-06096

UNOFFICIAL COMPOSITE; GENERAL PERMITTING PROCEDURES FOR COASTAL ZONE ACTIVITIES IN FLORIDA. Florida Dept. of Natural Resources, Tallahassee. Coastal Coordinating Council.

Report, June 1971. 16 p., 16 chart.

Descriptors: "Permits, "Coasts, "Dredging, "Florida, "Coastal structures, Control, Regulation, State governments, Coastal plains, Bulkheads, Docks, Administrative agencies, Navigation, Mining.
Identifiers: Fill permits.

General information regarding permitting procedures for Florida coastal zone activities is presented. Although specific information regarding individual agency procedures are not enumerated, various flow charts are included to serve as guidelines for obtaining permits. Among the flow charts included are those dealing with navigation dredging in or adjacent to navigable waters, dredging for utilities installation, bulkhead line establishment, marine/commercial dock licenses, private docke permits, navigational aids, oyster leases, oil or gas leases on state lands, and aquaculture leases. Additionally, flow charts for oil drilling permits, permits to construct artificial reefs, and coastal construction permits for breakwaters, seawalls, and groins below the mean high water line are included. Permits from local, state and federal authorities are included in the flow charts. (Mockler-Florida)

NEW ENGLAND INTERSTATE WATER POL-LUTION CONTROL COMMISSION. For primary bibliographic entry see Field 06E. W73-06108

WATER POLLUTION CONTROL. For primary bibliographic entry see Field 06E. W73-06106

ENVIRONMENTAL LAW-RETROACTIVE AP-PLICATION OF THE NATIONAL ENVIRON-MENTAL POLICY ACT.

Tennessee Law Review, Vol 39, No 4, p 735-747, Summer 1972.

Descriptors: "Environmental effects, "Administrative decisions, "Federal project policy, "Legal spects, Federal government, Administrative agencies, Tennessee Valley Authority, Environmental control, Ecology, Judicial decisions, Adjudication procedure, Project planning, Watercourses (Legal aspects). Identifiers: "National Environmental Policy Act, Environmental impact statement.

Section 102 of the National Environmental Policy Act of 1969 requires all federal agencies involved in projects which will produce a major effect on the environment to submit an environmental impact statement, detailing any adverse environmental inpact statement, detailing any adverse environmental affects which will occur if the action is adopted. Many federal projects were in some stage of development when the Act became effective on January 1, 1970. The issue of whether the Act required impact statements on those projects already in progress when the Act was enacted has been dealt with by several courts in several different ways. Some courts have focused on specific federal action, or on a particular date, to determine whether the project was initiated before the Act became effective. If the court decides that the major federal action occurred before January 1, 1970, then the Act's mandate may be held inapplicable to the ongoing project. Approval dates for projects have been declared determinative of the question of NEPA's applicability. However, a U.S. District Court recently held that environmental impact statements are required for ongoing federal projects even if these projects were initiated prior to NEPA enactment. It appears that the issue concerning any retroactive character of Section 102 at present requires a case-by-case approach. (Adams-Florida)

PREPARATION OF AN ENVIRONMENTAL IM-PACT STATEMENT, For primary bibliographic entry see Field 06G. W73-06108

ARKANSAS RIVER BASIN COMPACT, AR-KANSAS-OKLAHOMA. For primary bibliographic entry see Field 06E. W73-06109

ENVIRONMENTAL CITIZEN ACTION. For primary bibliographic entry see Field 06E. W73-06110

SAN FRANCISCO OIL SPILL. For primary bibliographic entry see Field 06E. W73-06111

IMPLEMENTATION OF THE RESOURCE RECOVERY ACT OF 1976. For primary bibliographic entry see Field 06E. W73-06112

WATER AND SEWERAGE PLANTS AND SYSTEMS IN GENERAL; SEWERAGE DIS-TRICTS AND SEWERAGE DISTRICT BOARDS. For primary bibliographic entry see Field 66E. W73-06117

POLLUTION OF WATER. For primary bibliographic entry see Field 06E. W73-06118

IN THE MATTER OF GAE FARMS INC. V. DIAMOND (CONSTITUTIONAL CHALLENGE TO STATE ENVIRONMENTAL CONSERVATION DEPARTMENT'S CLASSIFICATION OF STATE WATERS).

For primary bibliographic entry see Field 06E. W73-06120

WATER SUPPLY: WATER QUALITY MANAGEMENT AND CONTROL. For primary bibliographic entry see Field 06E. W73-06123

Group 5G-Water Quality Control

RHODES V. POLLUTION CONTROL BOARD (LANDFILL OWNER MAY NOT CLOG FLOODGATE WITH REFUSE). For primary bibliographic entry see Field 06E. W73-0612.

ENVIRONMENTAL LAW-SUBSTANTIVE REVIEW UNDER THE NATIONAL ENVIRON-MENTAL POLICY ACT OF 1969, For primary bibliographic entry see Field 06E. W73-06127

CITIZENS FOR CLEAN AIR, INC. V. CORPS
OF ENGINEERS, UNITED STATES ARMY
(VALIDITY OF CONSTRUCTION PERMIT
WHERE CORPS OF ENGINEERS FAILED TO
EVALUATE ENVIRONMENTAL IMPACT OF
WATER INTAKE AND DISCHARGE SYSTEM).
For primary bibliographic entry see Field 06E.
W73-06128

WATER BARRIER FLOTATION CURTAIN, Preformed Line Products Co., Cleveland, Ohio.

U. S. Patent No. 3,691,773, 6 p, 19 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 3, p. 857, September 19, 1972.

Descriptors: "Patents, "Oil pollution, Oil spills, Equipment, Barriers, Water pollution control, Lakes, "Waves (Water), Water quality control. Identifiers: "Water pollution prevention.

This flexible water barrier designed to prevent pol-lution and withstand wave action is made of a sandwich-like construction. A flotation device is adapted to float beneath the surface of the water mappen to most beneath the surface of the water and one rides along the surface of the water to pro-vide an obstacle to surface debris. The apparatus is anchored to the bottom. The lower edge of the barrier follows the contour of the floor of the body of water. (Sinha-OEIS)

OIL RECOVERY VESSEL FOR THE REMOVAL OF OIL AND OTHER POLLUTING MATTER FLOATING ON THE WATER SURFACE,

W. Heinicke.
U. S. Patent No. 3,690,464, 4 p, 8 fig, 7 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 2, p. 504, September 12, 1972.

Descriptors: "Patents, "Oil pollution, "Oil spills, Oily water, Water pollution control, Water quality control, Equipment, "Separation techniques, Abatement, "Pollution abatement. Identifiers: "Water pollution prevention, Vessels.

The forebody of the vessel is provided with an opening immediately beneath the water surface, which forms the opening of a funnel with a vertical axis. A conduit is connected to the vertical axis. A axis. A conduit is connected to the vertical axis. A conduit is connected to the vertical axis. A conduit is section propeller is mounted in the conduit. The propeller blades are bent at their forward edges. Within the vessel the oil and water are separated and water is disposed in from the compartment near the stern of the vessel. (Sinha-OEIS) W73-06141

FLOATING SUCTION HEAD, Secretary of the Navy, Washington, D.C. (assignee). J. A. O'Brien.

U. S. Patent No. 3,690,463, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 2, p. 504, September 12, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Equipment, Separation techniques, Oceans, "Pollution abatement, Abatement, Water pollution control, Water quality control. Identifiers: "Water pollution prevention.

This device comprises a buoyant suction head with upper and lower surfaces connected with a peripehral wall. The wall has tapered V-shaped suction intake ports. A vertical tube receives the waste oil which is sucked into the head. A series of debris screens surround the head to prevent clogging. The oil is retained in a special holding area. Three suction head assemblies may be used simultaneously with the same suction source to increase pick up efficiency. (Sinha-OEIS) W73-06142

OIL AND WATER SEPARATING DEVICE, Oil Mop, Inc., Metairie, La. (assignee). H. M. Rhodes. U. S. Patent No. 3,689,407, 2 p, 1 fig, 6 ref; Offi-cial Gazette of the United States Patent Office, Vol. 902, No. 1, p. 260, September 5, 1972.

Descriptors: "Patents, "Oily water, Oil wastes, "Oil pollution, "Separation techniques, Abatement, "Pollution abatement, Equipment, Water quality control, Water pollution control. Identifiers: "Polypropylene, "Polystyrene, Water pollution prevention.

The oil and water mixture is poured over two oil attracting media each having a different physical characteristic. The second oil attracting media is placed between two floats having different specific gravities so that the second oil attracting media is wrung out by compression to release the oil and permit it to rise above the water level in the apparatus. The oil attracting media are made of this strips of polyproplene. The first, perforate float placed between the oil attracting media is made of two inch thick cast polystyrene and has a specific gravity of 0.1. An imperforate float, placed beneath the second oil attracting media is made of polystyrene having a specific gravity of 0.9 (Sinha-OEIS) 0.9. (Sinha-W73-06143

METHOD FOR SEPARATING OILS FROM For primary bibliographic entry see Field 05D. W73-06144

FLOATING SELF ADJUSTING SKIMMER, Shell Oil Co., New York. (assignee). P. E. Titus, and J. R. Hanson. U. S. Patent No. 3,688,909, 4 p, 7 fig, 5 ref; Offi-cial Gazette of the United States Patent Office, Vol. 902, No. 1, p. 151, September 5, 1972.

Descriptors: *Patents, Oil spills, *Oil pollution, *Skimming, Abatement, *Pollution abatement, Equipment, Water quality control, Water pollution Identifiers: *Water pollution prevention.

This mechanism comprises a buoyant platform, a receptacle having a weir mounted on the platform, and a pivoting device. An intake conduit extends into the receptacle for removing liquids accumulated within it. A stabilizer extends around a substantial portion of the periphery of the skimmer to prevent submergence of the weir due to wave or current movement of the liquids. The receptacle contains a cylindrical drum of moderate size and has a small moment of inertia about its longitudinal axis. When an excess amount of liquid is accumulated in the drum, the buoyant moment exceeds the gravitational moment thereby elevating the weir and decreasing the liquid flow into the drum. A screen prevents flotsam from entering the conduit. (Sinha-OEIS)

APPARATUS FOR REMOVING OIL SLICK FROM WATER SURFACES,

PRUM WALES GOVERNOON.

A. E. Marcocchio.

U. S. Patent No. 3,688,506, 5 p, 8 fig, 6 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 1, p. 35, September 5, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Lakes, Rivers, Streams, Oceans, Estuaries, Abatement, "Pollution abatement, Water quality control, Water pollution control, Equipment, Separation techniques. Identifiers: "Water pollution prevention.

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A barge-like float and two series of booms extending as an inverted V outward from the forward end of the float are described. The booms guide the oil slick towards the forward end of the float. As the barge is towed the relative movement causes the oily water to be drawn into the float where it is separated. The oil may be pumped into an adjacent barge. The booms consist of an upright wall member and a pair of elongated floats attached to each side of the wall. The booms are lashed so that they are free to ride the ocean swells and waves. (Sinha-OEIS) W73-06149 W73-06149

WATER SOFTENER SYSTEM, Ecodyne Corp., St. Paul, Minn. (assignee). For primary bibliographic entry see Field 05F. W73-06152

ARRANGEMENT FOR FORMING A WATER SHIELD TO EXTINGUISH FIRES IN WATER COVERED AREAS,

E. Gracia. U. S. Patent No. 3,685,584, 3 p, 8 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 901, No 4, p 1276, August 22, 1972.

Descriptors: "Patents, Oil spills, "Oil pollution, Oceans, Coasts, Platforms, Oil wells, Gas wells, "Offshore platforms, Drilling, Abatement, "Pollu-tions abatement." tion abatement. Identifiers: *Fire extinguishing, *Water pollution

This invention relates to extinguishing fires which occur on platforms or other structures from which oil and gas wells are drilled in the water covered area. The water shield includes a floating apparatus that can be positioned to enclose the fire. It has jet nozzles to provide the water. A barrier skirt hangs downward into the water to trap contaminants. A conduit is used to suck up contaminants which are discharged into a container to avoid pollution. (Sinha-OEIS)

METHOD OF AND APPARATUS FOR AERAT-ING WATER, Standard Oil Co. (Indiana). Chicago, Ill. (as-

For primary bibliographic entry see Field 05D. W73-06155

AERATING APPARATUS AND METHOD, Improved Machinery, Inc., Nashua, N.H. (as-For primary bibliographic entry see Field 05D. W73-06156

OFF-SHORE FIRE AND POLLUTION CONTROL SYSTEM, F. R. Washburn. U. S. Patent No. 3,673,804, 2 p, 13 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 60, July 4, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Abatement, "Pollution abatement, Treatment, Separation techniques, Water pollution controls, "Leakages, Water quality control, Water quality, Water pollution Water pollution. Identifiers: Offshore fires, *Fire control.

The floating firewall consists of a rectangular gal-vanized metal body with four identical flotation packets, two on each side of the metal body. Steel

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control-Group 5G

bands secure the flotation packets to the body and a rigid shelf is mounted above the packet to hold it in place. Ballast weights connected by cables to the bottom edges of the body keep it in an upright position. The system is intended to confine oil or floating chemicals until they can be collected. (Sin-M-OEIS) W73-06157

INDUCED CONTROLLED UPWELLING,

B. Girden.
U. S. Patent No. 3,683,627, 5 p, 3 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 901, No 3, p 830, August 15, 1972.

Descriptors: "Patents, "Upwelling, Lakes, Reservoirs, Mixing, Oceans, Circulation, Convection, "Aeration, "Nutrients, "Oxygenation, Thermocline, Temperature, Waste water treatment, Water pollution treatment, Ice, Water pollution control, Water temperature.

Upwelling of sub-surface water is accomplished by pumping air into the lowest of a series of dissolving chambers. Undissolved air also forms bubbles to lift the water and begin the formation of a jet stream. A jet stream is formed which reaches the surface of the water and spreads outward in a radiating current. Air is dissolved into the water, excess bubbles start the upward motion of the saturated water until the water forms its own buoyancy. A current is started and continues its drive to the surface. Nutrients may be carried to the surface and water temperature changes may also occur. (Sinha-OEIS) W73-06158

THE REGIONAL WATER SUPPLY AND WATER POLLUTION CONTROL PLANS.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.
For primary bibliographic entry see Field 06B.

PLANNING AND EVALUATION OF MULTIPLE PLANNING AND EVALUATION OF MULTIPLE
PURPOSE WATER RESOURCE PROJECTS IN
A MULTIOBJECTIVE ENVIRONMENT: AN
OVERVIEW AND POST AUDIT ANALYSIS,
INTASA, Inc., Menlo Park, Calif.
For primary bibliographic entry see Field 06B.
W73-06191

PLANT PATHOGENS AS BIOCONTROLS OF AQUATIC WEEDS, Florida Univ., Gainesville, Dept. of Plant Patholo-

gy. For primary bibliographic entry see Field 05C. W73-06206

RESTORATION OF BEACHES CON-TAMINATED BY OIL, Meloy Labs., Inc., Springfield, Va.

Metoy Laos., inc., Springrieid, va. G. D. Gumt. G. D. Gumt. G. D. Gumt. G. Copy available from GPO Sup Doc as EPI.23/2:72-045, \$3.50. Environmental Protection Agency, Technology Series Report EPA-R2-72-045, September 1972. 138 p. 20 fig. 2 tab, 3 append. EPA Project 15080 EOT, Contract 14-12-809.

Descriptors: *Oil pollution, Water pollution control, *Sands, *Oil spills, Beaches, *Froth flotation, Aeration, *Flotation, Oil-water interfaces. Identifiers: Mobile facility, Field operations,

Based on laboratory studies, a 30 ton per hour pilot plant was built for cleaning oil contaminated beach sands. The plant utilized the principle of froth flotation. Extensive field testing considered different oils, feed concentrations, both brackish and sea water, and a range of processing condi-tions. Forty one field tests were conducted at the

U.S. Navy's Fleet Anti-Air Warfare Training Center at Dam Neck, Virginia. These varied from nominal runs with sand feed rates of 30 tons per hour and oil concentrations of 0.5% to oil/water separations at high capacity. Using the test results, a mobile unit was designed, constructed, field tested, and delivered to the Environmental Protectested, and delivered to the Environmental Protection Agency. Data were obtained on the effects on cleaning efficiency of relevant process parameters: (1) sand feed rate, (2) feed steadiness, (3) oil type, (4) oil concentration, (5) sand age, (6) feed homogeneity, (7) water rate, (8) water type, (9) slurry density, (10) residence time, (11) aeration, (12) temperature, (13) surfactant effects, (14) organic solids effects, and (15) oil deposition on wet or dry sand. The mobile unit operated successfully under a wide range of conditions. This device should prove a valuable adjunct to existing oil spill cleanup procedures. (EPA)

ACID MINE DRAINAGE TREATMENT BY ION

Culligan International Co., Northbrook, Ill. For primary bibliographic entry see Field 05D.

WATER POLLUTION ASPECTS OF STREET SURFACE CONTAMINANTS, URS Research Co., San Mato, Calif. For primary bibliographic entry see Field 05B. W73-06212

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT, Iowa State Univ., Ames. Dept. of Agricultural En-

gineering.
J. R. Miner, D. Bundy, and G. Christenbury. Copy available from GPO Sup Doc as EPI.23/2:72-101, \$2.00. Environmental Protection Agency, Technology Series Report EPA-R2-72-101, December 1972. 137 p, 4 ref. EPA Project 13040 FUU.

Descriptors: *Farm wastes, *Bibliographies, *Cat-tle, *Hogs, *Sheep, *Poultry, Fish farming, *Feedlots, *Confinement pens, Research and development, Agricultural runoff, Waste identifi-cation, Waste treatment. Identifiers: Waste management, Author index, Key work index.

This bibliography makes sources of information available to researcher, designer, regulatory offi-cial and others interested in the latest develop-ments in animal waste handling, treatment, disposal or reuse. References include title, author, disposal or reuse. References include title, author, key words and source data for 241 journal papers, 425 papers published as conference proceedings, 114 university or government publications, 71 unagazine articles, 26 books or book chapters, 15 unpublished papers, and 53 academic theses. Any one of these items may be identified and the reference located by knowing the author's name, title of the article, or by checking the subject matter listing. (See also W73-05011) (EPA) W73-06214

THE QUALITY OF COASTAL WATERS: FIRST ANNUAL PROGRESS REPORT. Hawaii Univ., Honolulu. Water Resources Research Center.

Technical Report No 60, Sea Grant Program No. UNIHI-Sea Grant-72-01, Septermer 1972. 213 p, 48 fig, 68 tab, 49 ref.

Descriptors: *Coasts, *Water quality, Sediments, Biota, *Hawaii, Pesticides, Pollutants, Metals, Nutrients, Sugarcane, Sewage, Water quality standards. Identifiers: *Coastal waters.

Summarized are the nature and results of the first year of experimental and evaluative work of a multi-directional, multi-disciplinary study directed to identifying and evaluating the social, political, economic, educational, institutional, and scientific and technological factors which impede or expedite the protection and restoration of coastal water environments in Hawaii, as well as of developing the crucial scientific and rational parameters needed in formulating effective policies, institutions and systems. The project seeks to evaluate water quality in terms of stress or well being of aquatic communities, using the traditional evaluate water quality in terms of stress or well being of aquatic communities, using the traditional chemical, biological, and bacterial parameters of water quality only to identify the factors and their concentrations which are of ecological sig-nificance. In all situations special attention was given to the pesticides, heavy metals, and nutrients in water and sediment and to evidence of stress on aquatic communities. W73-06259

REVIEW DRAFT, PROPOSED REPORT OF THE NATIONAL WATER COMMISSION, VOLUME I. National Water Commission, Arlington, Va. For primary bibliographic entry see Field 06E.

REVIEW DRAFT, PROPOSED REPORT OF THE NATIONAL WATER COMMISSION VOLUME II. National Water Commission, Arlington, Va. For primary bibliographic entry see Field 06E. W73-06261

AG CLORDANE: DEVELOPMENT OF METHODS FOR ITS ANALYSIS AND CON-TROL, Velsicol Chemical Corp., Chicago, III. For primary bibliographic entry see Field 05A. W73-06291

EFFECT ON MYCOBACTERIUM TUBERCU-LOSIS PRODUCED BY SOME FACTORS IN-CIDENT TO SELF-PURIFICATION OF WATER BASINS, (IN RUSSIAN),

Probl Tuberk. Vol 49, No 12, p 60-63. 1971. English summary.

Identifiers: Microbial studies, *Mycobacterius tuberculosis, Protozoa, Water purification, *Self purification, *Pathogenic microflora, urification,

Of all biological factors participating in self-purifi-cation of aqueous medium the antimicrobial activi-ty of the Protozoa was most active with regard to destruction of pathogenic flora including M. tu-berculosis. Inasmuch as self-purification of aqueberculosis. Inatmuch as sett-purification of aque-ous medium from pathogenic microflora appears as a consequence of natural antagonism and com-petition among hydrobionts this offers the possi-bility of utilizing Protozoa in purification of aque-ous medium contaminated with M. tuberculosis.— Copyright 1972, Biological Abstracts, Inc. W73-06312

DEVELOPMENT AND DISPLAY OF MULTI-PLE-OBJECTIVE PROJECT IMPACTS, Purdue Univ., Lafayette, Ind. Dept. of Agricul-tural Economics. For primary bibliographic entry see Field 06B. W73-06358

ENERGY: THE SQUEEZE BEGINS, J. H. Krieger. Chemical and Engineering News, Vol 50, No 46, p 20-37, November 13, 1972. 5 fig.

Group 5G-Water Quality Control

Descriptors: *Oil, *Nuclear powerplants, *Coals, Pattural gas, Energy, Energy conversion, En-vironment, Economics, Offshore platforms, Drilling, Mining, Thermal pollution, Oil pollution, Sulfur, Pipelines, Boats.

The approaching energy crisis in the United States; its causes, its effects, and what is being done to avoid it are described. The major sources of energy discussed are natural gas, petroleum, coal, and nuclear power plants. Increasing population and a rising standard of living contribute to a greater demand for more energy. While reserves are growing smaller, environmental regulations block the use of some fuels and slow the development of nuclear generators. The need for, and efforts toward the development of a national energy policy are considered. Also considered are the effects of this energy squeeze on such areas of the society as economics and environmental stability. Short, middle, and long range solutions to the problem of energy, such as increased petroleum import quotas, conversion of coal to gas, an inproblem of energy, such as increased petroleum import quotas, conversion of coal to gas, an increasing number of nuclear power plants and a hydrogen based energy system are discussed. As an alternative to the development of greater energy sources, the spread of an energy conservation consciousness, which would result in a decrease in consumption, is seen. (Jerome-Vanderbilt) W73-06370

WATER POLLUTION: SOUTH PLATTE RIVER, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. S. R. Nichols.

M Sc Thesis, March, 1972. 214 p, 8 fig, 26 tab, 156 ref. OWRR A-010-COLO (1).

Descriptors: "Water pollution, "Pollution abatement, "Water pollution control, "Colorado, "Federal Water Pollution Control Act, Water pollution sources, Water pollution effects, Rivers, Groundwater, Surface waters, Water Quality Act, Water quality standards, Water pollution treatment, State governments, Water quality, Water analysis Reviews.

Identifiers: "South Platte River (Colo).

This investigation examines the interrelation of Federal-State-local political mechanisms, the related laws generated by these institutions, the means by which pollution is measured and water quality managed, and speculates on this system's shortcomings and needs. The South Platte River basin in Colorado is the target of this investigation because it contains most of the people in Colorado, has a history of serious water quality problems, and faces increasing future water demands, which will require a greater cognizance of water quantity and quality management. Groundwater pollution problems seem less acute than surface water. Surface water resources have been fully appropriated for irrigation use. In summer, tace water. Surface water resources have been fully appropriated for irrigation use. In summer, very low flows occur at many points along basin streams, where agriculture diversions may use all, or nearly all, of the available streamflow. These low flows exacerbate the pollution concentration by the absence of dilution water. (Woodard-USGS) W73-06391

COMMUNITY MOSQUITO CONTROL PRO-GRAM: EVALUATION OF SECOND YEAR'S PROGRAM, Agricultural Research Service, Little Rock, Ark. Environmental Research Div. J. T. Lee, M. V. Meisch, and J. L. Lancaster, Jr. Arkansas Farm Research, p 9, November-December, 1971.

Descriptors: "Mosquitoes, "Aquatic insects, "In-sect control, "Arkansas, Standing waters, Agricul-ture, Rice, Insecticides, Larvicides, Application methods, Reviews, Evaluation. Identifiers: "New Jersey light traps (Mosquitoes).

The year 1971 was the second of a three-year study designed to serve as an example of mosquito control within the budget of a community or town in the rice-growing areas of Arkansas. Adulticides were applied aerially and by Leco ULV coldaerosol generators. The only difference in application of insecticides from 1970 was the addition of a second ULV generator, a heavy-duty model as opposed to the standard unit used in 1970. Malathion was used in most ground applications; however, chlorpyrifos and naled were each used once. Fenthion was used earially. Mosquito populations were monitored by 8 standard New Jersey light traps. Light trap records are for Phosophora confinis, the dark ricefield mosquito. This was the dominant species present. Anopheles app. occurred in light to moderate numbers after August 1 in both years but catches never averaged over 100 per night. Populations were much higher in 1970 with as many as 4,100 trapped in a single night and exceeding 1,000 per night on several occasions. In 1971, populations were never greater than 741 per night. These numbers are expressed as logarithms; numerically, a single trap in 1970 captured 38,000 specimens, while the maximum number in 1971 was 4,000. (Woodard-USGS)

REMOTE ACTUATED POLLUTION AND OIL FLOW CONTROL SYSTEM, H. S. Hayre.
U. S. Patent No. 3,697,952, 4 p, 2 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 903, No 2, p 724, October 10, 1972.

Descriptors: *Patents, *Leakage, *Oil pollution, Equipment, Oil wells, Abatement, *Pollution abatement, Water quality control, Water pollution Identifiers: *Water pollution prevention

The position of a high-low valve on oil wells is remotely controlled and monitored from a distant control station to cover possibilities of oil leakage at a well or failure of the shutoff valve at the well head. RAPOCS uses secret code for sets of wells to distinguish individual firms. It operates at radio frequency in the HF range of 3-30 megahertz. (Sinha-OEIS) W73-06417

SURFACE OIL CONTAINMENT DEVICE,

U. S. Patent No. 3,695,042, 3 p, 5 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 903, No 1, p 61, October 3, 1972.

Descriptors: "Patents, "Oil spills, "Oil pollution, Equipment, Abatement, "Pollution abatement, Quality control, Water quality control, Water pol-lution control. Identifiers: *Water pollution prevention.

This device includes hanger float structures which are spaced around the area in the water that is to be confined. A suspension cable is carried by the hanger floats and a continuous flexible wall made of waterproof canvas is suspended from it. The lower part of the flexible wall becomes and remains submerged even in high seas. (Sinha-OEIS)
W73-06428

SHROUDED DRUM SKIMMER, FMC Corp., San Jose, Calif. (assignee) T. J. Tillett, and B. Straus. U. S. Patent No 3,693,805, 3 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1318, September 26, 1972.

Descriptors: "Patents, "Oil pollution, "Oil spills, Skimming, Equipment, Streams, Oceans, Pollution abatement, Water pollution control, Water quality control.

Identifiers: "Water pollution prevention.

This drum-type skimmer has a shroud which is disposed radially from the lower portion of the submerged drum. The shroud reaches below the liquid level. The radial spacing between the shroud and the outer surface of the drum is selected for effective cohesive action. (Sinha-OEIS) W73-06431

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WATER SURFACE SKIMMER WITH CHECK

VALVE, Texaco Inc., New York. (assignee)

L. C. Pogonowski.
U.S. Patent No. 3,693,801, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1318, September 26, 1972.

Descriptors: *Patents, Skimming, *Oil spills, *Oil pollution, Equipment, Lakes, Rivers, Streams, Oceans, *Pollution abatement, Water quality control, Water pollution control. Identifiers: *Water pollution prevention.

This surface skimmer is actuated by a vacuum source to promote the flow of oil or other liquid floating at the water's surface, through the skimmer by way of a submerged inlet. A check valve is automatically operated if the skimmer is anadvertently urged to a position above the water's surface where it would otherwise permit air to be drawn into the vacuum system. (Sinha-CEI) OEIS) W73-06432

FLOATING SURFACE SKIMMER, Acme Products Inc., Tulsa, Okla. (assignee)
H. E. Stanfield, G. W. Stanfield, and G. Camp H. E. Stantieto, C. W. Stantieto, and G. Camp. U. S Patent No. 3,693,800, 3 p. 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1317, September 26, 1972.

Descriptors: *Patents, Skimming, *Oil spills, *Oil pollution, Equipment, Oceans, Lakes, Rivers, Streams, *Pollution abatement, Water quality, Water pollution control. Identifiers: *Water pollution prevention.

The basic elements of this skimmer are a bowl and a float from which the bowl is supported. The bowl serves as a weir and is placed near to and slightly below the surface of the water. An exhaust hose is connected to the interior of the bowl. The exhaust hose also is connected with a source of vacuum so as to be able to remove the akimmed substance from the bowl. (Sinha-OEIS) W73-06439.

METHOD AND APPARATUS FOR AVOIDING WATER POLLUTION AT AN OFFSHORE DRILLING SITE, Texaco inc., New York. (assignee)

U. S. Patent No. 3,693,733, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 902, No 4, p 1303, September 26, 1972.

Descriptors: *Patents, *Offshore Drilling, "Oil wells, Detergent, Mud, Equipment, Treatment, Industrial wastes, Oceans, "Pollution abatement, Water pollution control.

Identifiers: "Water pollution prevention.

The treating process includes the sequential separation and washing of drill cuttings to free them of water contaminating components. The washing is accomplished by using a detergent circulatory system in which particulated cuttings are removed from the mud. The cuttings are washed and rinsed and returned to the body of water. Both the mud and detergent solution may be recycled. (Sinha-OEIS)
W73.06434

REPORT TO THE SANITARY WATER BOARD ON POLLUTION OF SLIPPERY ROCK CREEK, VOLUME II. Pennsylvania Dept. of Health, Harrisburg. Div of Sanitary Engineering.

Publication No 17, April 1967. 109 p, 10 fig, 10 tab, 4 ref.

Descriptors: "Acid mine water, "Acid streams, "Mine drainage, "Stream improvement, "Water pollution control, "Coal mine wastes, Strip mine wastes, Water pollution sources, Neutralization, Water quality control, Mine water, Mine acids, Coal mines, Water analysis, Waste water treatment, Sanitary engineering, Chemical analysis, Pennsylvania, Acidic water, Planning, Laboratory tests, Sampling, On-site data collections.

Identifiers: *Slippery Rock Creek.

Identifiers: *Slippery Rock Creek.

Slippery Rock Creek in western Pennsylvania has a pollution problem due to the development of extensive coal mining without concurrent pollution control regulation. In order to determine the full extent of the pollution problem, this study was conducted to evaluate the chemical and biological nature of the Creek. Slippery Rock Creek is forty-seven miles long with recreational facilities at the lower end. The primary pollution problem is that of excessive acidity. The basic recommendation of this study is to provide five neutralization plants to neutralize the acid waters. The construction cost of these five plants is estimated to be \$447,000. The total annual operating cost is estimated at \$85,400. About 34 sampling stations were used in the study and parameters for analysis included \$94, alkalinity, acidity, iron, sulfates, chlorides, manganese, aluminum, dissolved oxygen and temperature. Wide variations were noted in all parameters tested; for example, pH varied from 3.5 to 9.3, total iron from 0.2 mg/l to 6.7 mg/l and sulfates from 4.8 mg/l to 440 mg/l. Besides neutralization of acid water, further recommendations include the removal of neutralized solids and a continuous monitoring of water quality. An additional recommendation is the improundment of tions include the removal of neutralized solids and a continuous monitoring of water quality. An addi-tional recommendation is the impoundment of Slippery Rock Creek near the headwaters to pro-vide for recreational uses and the placement of a lime neutralization facility below the dam to en-sure maximum water quality in other parts of the Creek. (Poertner) W73-06458

LAND RECLAMATION, A RECYCLE PROGRAM WHICH COMPLETELY SOLVES THE SEWAGE SOLIDS PROBLEM,
Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 05E. W73-06461

FLOW SIMULATION SYSTEM, Metropolitan Sanitary District of Greater Chicago, III. For primary bibliographic entry see Field 04A.

SEPARATION OF COMBINED WASTEWATER OF AND STORM DRAINAGE SYSTEMS, SAN FRANCISCO STUDY AREA. Brown and Caldwell, Inc., San Francisco, Calif. For primary bibliographic entry see Field 08B. W73-06470

THE AQUATIC ECOLOGY OF TOMS RUN, CLARION COUNTY, PENNSYLVANIA PRECEDING WATERSHED RECLAMATION, Clarion State Coll., Pa. Dept. of Biological B. H. Dinsmore. Pennsylvania Department of Health, Bureau of Sanitary Engineering, Division of Water Quality Publication No. 21, Harrisburg, 1968. 64 p, 17 fig, 15 tab. 20 ref.

Descriptors: "Mine drainage, "Aquatic environment, "Oil pollution, "On-site data collections, "Water pollution effects, "Stream improvement, Pennsylvania, Aquatic habitats, Water pollution control, Planning, Water quality control, Water resources management, Industrial wastes, Coal mine wastes, Mine acids, Strip mine wastes, Oil water than the control of the contr wells. Identifiers: Toms Run, Gas wells.

Identifiers: Toms Run, Gas wells.

The pollution of Toms Run, a stream in Western Pennsylvania, has developed concurrently with the development of the oil, gas and coal mining industries. But the stream is not seriously polluted throughout its entire length. Many of its tributaries offer a clean water supply which could potentially provide for biological recovery of Toms Run. Restoration of the Toms Run is recommended as the first project of its kind requiring the coordinated participation of all state agencies. The program includes the plugging of oil and gas wells, strip mine reclamation, revegetation, swamp drainage, and resurfacing of haulage and service roads to prevent pollution from surface runoff. River bottom characteristics were found suitable for a variety of invertebrates in about one-half of the stream, physically and chemically, was between Township Route 627 and Station 21 where macro-invertebrates were reduced in both number of species and total bio mass due to soft deposits of iron compounds. Benthic organism collections in unpolluted tributaries and in Toms Run below these tributaries show the potential for stream recovery. (Poertner) stream recovery. (Poertner) W73-06472

STUDY OF ECONOMIC IMPACTS OF POLLU-TION CONTROL ON THE IRON FOUNDRY IN-DUSTRY, PARTS I, II, AND III. Kearney (A. T.) and Co., Chicago, Ill.

Available from the National Technical Informa-tion Service Pt 1 as PB-207 147, \$3.00 in paper copy, Pt II as PB-207 148, \$5.45 in paper copy and, Pt III as PB-207 149, \$4.50 in paper copy, \$0.95 in microfiche each. Report prepared for Council on Environmental Quality, November 30, 1971. 158 p.

Descriptors: *Pollution abatement, *Standards, *Economic impact, *Iron, Industries, Metals, Costs, Prices, Employment, Competition, Air pollution, Water pollution. Identifiers: *Iron foundry industry, Foundries, Metal industry.

The iron foundry industry is composed of some 1,670 foundries of which 71 percent were small, 25 The iron foundry industry is composed of some 1,670 foundries of which 71 percent were small, 25 percent medium, and 4 percent large-sized. Because of foreign competition and domestic competition from substitute products, the costs of pollution abatement may not be entirely passed on to the consumer. Consequently, the rate at which the smaller, less efficient foundries have been closing will be accelerated. In 1961, over 700 foundries had fewer than 20 employees. By 1980, there will probably be fewer than 100 such firms. The effect of adding pollution control costs to other foundry costs will probably result in price increases ranging from \$2 per ton of castings for large, specialty foundries to \$14 per ton for small jobbing foundries. However, most jobbing castings constitute only a small part of the final product in which they are used, so the overall effect on final product cost should be relatively minor. Net unemployment created by the abatement-induced plant closings is estimated at approximately 13,300 by 1980. The areas affected the worst by plant closings and unemployment will be the Great Lakes states, Birmingham, and Los Angeles. (Settle-Wisconsin)

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: ALUMINUM, PARTS I, II AND III. Charles River Associates, Inc., Cambridge, Mass.

Available from the National Technical Informa-tion Service, Pt I as PB-207 164, \$3.75 in paper copy, Pt II as PB-207 165, \$3.45 in paper copy, and Pt III as PB-207 166, \$3.75 in paper copy, \$0.95 in microfiche each. Report submitted to The Council on Environmental Quality, December, 1971. 146 p.

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Descriptors: *Poilution abatement, *Standards, *Economic impact, *Aluminum, Industries, Prices, Employment, Profit, Metals. Identifiers: Nonferrous metals industries.

Identifiers: Nonferrous metals industries.

The economic impact of pollution abatement standards on the aluminum industry is studied. The relevant long-run cost to producers of installing and maintaining a given level of abatement facilities is the annual cost of abatement, defined to equal operating and maintenance costs of abatement facilities, interest charges, and depreciation. The combined annual costs of both air and water pollution abatement in the aluminum industry are estimated to reach \$287.44 million by 1977, or \$0.025 per pound of aluminum, although these costs may be as low as \$0.020 or as high as \$0.032 per pound. These cost should be translated into price increases of 6 to 7 percent by 1977. In the longer run, prices should increase by about 10 percent, implying a consumption level of about 10 percent level of about 10 perc (Settle-Wisconsin) W73-06475

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: ZINC, PARTS I, II AND III. Charles River Associates, Inc., Cambridge, Mass.

Available from the National Technical Informa-tion Service Pt I as PB-207 158, Pt II as PB-207 159, and Pt III as PB-207 160, \$3.00, in paper copy, \$0.95 in microfiche, each, Report submitted to the Council on Environmental Quality, December, 1971. 118 p, 3 fig, 11 tab.

Descriptors: "Pollution abatement, "Standards, "Economic impact, "Zinc, Industries, Metals, Costs, Prices, Employment, Competition. Identifiers: "Zinc industry, Metal industry.

Identifiers: *Zinc industry, Metal industry.

The economic impact on proposed pollution standards on the zinc industry is evaluated using pollution control cost estimates provided by the Environmental Protection Agency. At present, the major trends in the zinc market are the decline of older, high-cost mines and smelters, an increase in market concentration, and an increase in the foreign producers' share of the slab zinc market. The major impact of pollution control standards will be to accelerate these trends. Because of the pressures of foreign competition and the possibilities of substituting other materials for zinc, any price increases arising from the pollution standards are apt to be fairly small. In the absence of abatement costs, the trend toward less employment in mining and smelting is likely to continue. Abatement costs will accelerate this employment decline in the high-cost mines and smelters would reduce zinc output by 365,000 to 572,000 tons per year. If, in response, low-cost producers expand their output by 25 percent, there would be room for additional imports of 230,000 to 365,000 tons. (Settle-Wisconsin)

Group 5G-Water Quality Control

URBAN WATER MANAGEMENT, National Water Commission, Arlington, Va. En-gineering and Environmental Sciences Div. For primary bibliographic entry see Field 63D.

WATER QUALITY AND COMMUNITY VIA-

BILITY, Iowa State Univ., Ames. Dept. of Economics. For primary bibliographic entry see Field 06A. W73-06478

AN EVALUATION OF SUBSIDIES FOR WATER POLLUTION ABATEMENT, Clemson Univ., S.C. Dept. of Economics.

Clemson Only, S.C. Dept. of Economics.

H. H. Macaulay.

Paper prepared for the Joint Economic Committee, December, 1971. 42 p, 1 fig, 2 tab, 29 ref. OWRR B-030-SC (4).

Descriptors: *Water pollution, *Pollution abatement, *Regulation, *Standards, Evaluation, Costs, Prices, Industrial wastes, Municipal wastes, Economic efficiency, Cost-benefit analysis. Identifiers: Subsidies.

Identifiers: Subsidies.

Subsidies for water pollution abatement can be categorized as (1) regulatory subsidies, (2) subsidies industry, and (3) subsidies to municipalities. The most important of these subsidies is the regulatory subsidy that requires firms and municipalities to attain higher and higher levels of water quality in their effluent discharges so that consumers of water quality, primarily those who demand clean water for recreational and aesthetic purposes, can enjoy these uses. An analysis of the limited data available suggests that the benefits of regulatory subsidies may be quite small relative to their implicit costs. Annualized costs for producing water purity are estimated to be more than \$3.1 billion in 1970 and \$3.8 billion in 1975. An estimate of water quality benefits and a comparison with other recreational expenditures suggests that recreational benefits of these regulatory subsidies may be only \$1 billion a year. Furthermore, as firms and municipalities are required to attain higher levels of purity in their affluent, the abatement costs will ultimately be passed on to the consumer. Such charges will tend to be regressive while the benefits will tend to be progressive. (Set-tle-Wisconsin)

INDUSTRY EXPENDITURES FOR WATER POLLUTION ABATEMENT,
National Industrial Conference Board, New York.
L. Lund.

Conference Board Report No. 541, 1972. 108 p, 74 tab, 5 append. EPA-14-12-844.

Descriptors: *Industrial wastes, *Pollution abatement, *Expenditures, Capital costs, Operating costs, Personnel, Surveys, Water pollution, Food processing industry, Textiles, Pulp and paper industry, Chemical industry, Oil industry. Identifiers: *Industrial water pollution, *Manufacturing plants, Questionnaire.

To evaluate the extent of the industrial pollution control effort from 1965 through 1969, 789 manufacturing plants in seven industries were surveyed. The industries studied were food and kindred product, textile mill products, paper and allied products, chemicals and allied products, petroleum products, rubber and plastics products, and primary metals. Between 1965 and 1969, 63 percent of the surveyed firms made some expenditure for the construction of pollution abatement facilities. The very large plants made more than 52 percent of the total outlays. However, these expenditures as a ratio of gross capital investment were about 2.4 percent for the small plants and less than 1 percent for the largest firms. For 1969, 463 plants reported expenditures of \$65,405,000 for operating reported expenditures of \$65,405,000 for operating

pollution abatement programs. The ratio of this outlay to the value of shipments was well under I percent, suggesting little impact on product prices. In-plant treatment procedures generated a mean operating cost per volume of waste water of \$75 per million gallons, exclusive of capitalization costs. The study and appendices provide detailed statistics on capital expenditures, operating costs and personnel requirements, and the volume and characteristics of industrial waste waters. (Settle-Wisconsiin)

THE COST OF POLLUTION ABATEMENT IN AMERICAN INDUSTRY, Environmental Protection Agency, Washington,

D.C.
M. J. Deutch.
In: Institute of Environmental Sciences, 1972
Proceedings, 18th Annual Technical Meeting, 'Environmental Progress in Science and Education,'
May 1-4, 1972, p 407-414. 3 charts, 6 tab.

Descriptors: *Pollution abatement, *Industrial wastes, *Economic impact, Costs, Financing, Taxes, Prices, Competition.

Several aspects of industrial pollution are briefly discussed including (1) the causes and magnitudes of pollution; (2) the cost of pollution abatement; (3) industrial economic parameters; (4) problems of public policy; (5) industry's ability to pass on abatement costs; (6) the role of business leadership; and (7) the need for incentives. The Council of Environmental Quality forecasts sharp increases in total abatement expenditures by 1975: 840 percent for air pollution abatement, 87 percent for water pollution abatement, and 37 percent for solid wastes. These abatement expenditures may cause price increases so substantial that the competitive position of certain U.S. products will be cause price increases so substantial that the competitive position of certain U.S. products will be seriously challenged by foreign competition. Also, substantial price increases may generate serious consumer resistance. For some industries, the outlays required for pollution abatement constitute such a high proportion of their profits that they may encounter serious difficulties raising the money. However, adequate tax incentives may help alleviate these problems. Although rapid tax write-offs of pollution abatement installations are granted by the federal government and by several state governments, greater tax advantages may be required for certain industries. (Settle-Wisconsin) W73-06482

ENVIRONMENTAL CONCERN AT LAKE TAHOR, A STUDY OF ELITE PERCEPTIONS, BACKGROUNDS, AND ATTITUDES, California Univ., Davis. E. Costantini, and K. Hanf. Environment and Behavior, Vol 4, No 2, p 209-242, June 1972, 17 tab, 12 ref.

Descriptors: *Attitudes, *Values, *Decision making, *Environmental effects, Social aspects, Psychological aspects, Political aspects, *Califor-

Identifiers: *Lake Tahoe, Environmental policy, Perceptions, Likert-type questions.

Environmental policy is determined through trial by political combat and is, therefore, among other things, a function of concern for environmental problems on the part of those persons in a position to make or affect relevant decisions. A perspective is needed from which to penetrate this growing but diffuse concern for environmental problems and thus to provide a more differentiated point of departure for the analysis of environmental policy-making. In profile fashion, the perceptions, backgrounds, and attitudes of significant factors affecting environmentally significant local – the Lake Tahoe Basin – are explored. On the basis of responses to a series of Likert-type questions by

some 300 people, who, by virtue of their position, reputation and activity, were identified as significantly affecting environmental decision-making, an environmental concern scale was constructed as a measure of the respondent's concern for environmental quality at Tahoe. Scores on this scale led to grouping the respondents in terms of variations in levels of concern; these variations were then examined in terms of their relationship with (1) other environmental dispositions and perceptions, (2) the social background, and (3) the political and social psychological attitudes of the decision-makers. Significant differences were found between high and low scorers on the concern scale along each of these dimensions. Those displaying a relatively high level of environmental concern were more likely to be professionals or governmental officials and less likely to be businessmen or anchored in the Tahoe area. (Davis - Chicago) W73-06498

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06. WATER RESOURCES PLANNING

6A. Techniques of Planning

OF SIMULATION
TO SMALL PROJECT APPLICATION TECHNIQUES TO SMALL PROJECT ANALYSES, Texas Water Development Board, Austin. System

Texas Water Development Board, Austin. System Engineering Div.
M. L. Holloway, and L. F. Tischler.
Meeting Preprint No. 1907, American Society of Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 26 p, 7 fig, 4 ref.

Descriptors: "Urban impact, "Planning, "Analytical techniques, "Simulation analysis, "Water resources development, Water supply development, Environmental effects, Economic Impact, Social impact, Project planning, Texas.

Social impact, Project planning, Texas.

The Texas Water Development Board is currently developing simulation techniques which possibly can be applied to single, small projects or a series of small projects. The techniques are used in the analysis of economic, environmental, hydrologic, and social impacts of water development projects. These impacts are interrelated and can be applied, with limitations, to analyzing small projects. Economic impacts basically describe the effect of the project on the market conditions in the project area. Input-output analyses of the sectors of the market are used to describe all market interrelationships. Environmental impacts are hard to quantify, but attempt to describe the effects of the project as set forth by the National Environmental Policy Act. Eight factors of social impact are considered: (1) social mobility provided by the creation or destruction of jobs, (2) physical environment, (3) health and illness, (4) public order and safety, (5) access to public services, (6) community stability, (7) demographic profile, and (8) democratic brocess. Interrelationships exist between all impacts considered. The process is thought to be too involved for detailed application to small projects unless they are performed in conjunction with other such projects. In a small project, the most important consideration is perhaps the hydrologic relationship of the project to the basin. (Poertner)

SYSTEMS APPROACH TO RIVER BASIN MANAGEMENT, Washington Univ., Seattle. S. J. Burges, and B. W. Mar. Meeting Preprint No. 1877, American Society of Civil Engineers National Water Resources Enineering Meeting, Washington, D. C., January 29-February 2, 1973. 30 p. 9 fig. 3 tab, 9 ref.

Techniques of Planning-Group 6A

Descriptors: "River basins, "Planning, "Systems analysis, "Simulation analysis, "Watershed (Basins), "Watershed management, Management, Water demand, Washington, Input-output analysis, Optimum development plans, Forecasting, Engineering, Comprehensive planning, Water resources.

Identifiers: "Yakima River Basin.

Conventional analysis of river basin management has deficiencies which systems analysis can overcome. Conventional analysis looks at a problem by itself, whereas systems analysis looks at the broad picture in a scientific manner. In conventional analysis, the side effects of a particular solution are often responsible for the creation of additional problems. In systems analysis, the least detailed work is needed in the beginning; more generalized questions need to be studied. Five steps of systems analysis are described: (1) identify the problem of concern, (2) identify the parameters of interest, (3) define the relationships between these parameters, (4) establish criteria for performing the analysis, and (5) develop the analysis by continual iterations of increasing detail until the desired solution is obtained. Only a core team of analysts is needed for steps one through four. It is important, however, to involve people who are familiar with the river basin studied. A very important procedure is to relate information gained to various parameters and their interrelationships. A case example of conventional analysis versus system analysis is described for the Yakima River Basin in the State of Washington. (Poertner)

INSTITUTIONAL ALTERNATIVES FOR PROVIDING PROGRAMMED WATER AND SEWER SERVICES IN URBAN GROWTH AREAS: A CASE STUDY OF KNOXVILLE-KNOX COUNTY, TENNESSEE, Tennessee Univ., Knoxville. Water Resources

Research Center. G. G. Hayes.

G. G. Hayes. Report Number 18, June 1972. 219 p, 10 fig, 4 tab, 162 ref. Price \$3.00. OWRR B-014-Tenn. (1). OWRR 14-31-0001-3336.

Descriptors: *City planning, *Water supply, *Municipal water, *Sewerage, *Reviews, *Urbanization, Cities, Urban areas, Community development, Utilities, Public utility districts, Sewage districts, Tennessee, Institutions, Population. Identifiers: *Knoxville (Tenn), *Knox County (Tenn), Case study.

Urban planners have used a variety of techniques, including zoning and subdivision regulations, in an attempt to guide urban development, often with limited success. Water and sewer systems have been used merely to provide service to areas needing such service. Such policies have led to urban sprawl and leapfrogging, Recognizing that water and sewer can be used as a growth control measure, various institutional arrangements are examined for the effectiveness in urban planning and the Knoxville-Knox County region is used as a case study area. Six basic guidelines are used to evaluate various arrangements; these are: (1) a regional approach sufficient to develop comprehensive plans, (2) close cooperation with other units of government, (3) possession of legal, financial and administrative capabilities sufficient for its purpose, (4) control over the officers of the institution, (5) adherence to federal and state guidelines, and (6) reorganization in accordance with political feasibility. No single institutional arrangement was found to be ideal for every situation. The present institutional arrangement in Knoxville-Knox County was found to be inadequate for urban growth control. (Poertner)

FACILITY LOCATION AND ROUTING MODELS IN SOLID WASTE COLLECTION SYSTEMS, Johns Hopkins Univ., Baltimore, Md. For primary bibliographic entry see Field 05D. W73-0603

A LEAST-COST ANALYSIS FOR THE HOUSTON SHIP CHANNEL,
Texas Univ., Austin.
For primary bibliographic entry see Field 05B.
W73-06062

THE ROLE OF SENSITIVITY ANALYSIS IN HYDROLOGIC MODELING, Maryland Univ., College Park. Dept. of Civil Engineering, Por primary bibliographic entry see Field 02A. W73-06246

WATER RESOURCE PLANNING IN SOUTH EAST ENGLAND, Essex River Authority (England). For primary bibliographic entry see Field 06D. W73-06352

DISTRIBUTION SYSTEM ANALYSIS BY DIGITAL COMPUTER, Howard Humphreys and Sons, Cons. Engrs., England. Humphreys (Howard) and Sons, Reading (England). For primary bibliographic entry see Field 04A. W73-06353

COMPUTERIZED PLANNING OF THE LEAST COST WATER DISTRIBUTION NETWORK, Water Planning for Israel Ltd., Tel-Aviv. For primary bibliographic entry see Field 04A. W73-06354

A DESCRIPTION OF THE EPRE HYDRODYNAMICAL-NUMERICAL MODEL, Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 02L. W73-06355

DEVELOPMENT AND DISPLAY OF MULTI-PLE-OBJECTIVE PROJECT IMPACTS, Purdue Univ., Lafayette, Ind. Dept. of Agricultural Economics. For primary bibliographic entry see Field 06B, W73-0638

COST SHARING AND MULTIORJECTIVES IN WATER RESOURCE DEVELOPMENT, National Bureau of Standards, Washington, D.C. Technical Analysis Div. For primary bibliographic entry see Field 06B. W73-06359

NATURAL RESOURCE INFORMATION SYSTEM, DESIGN ANALYSIS. Boeing Computer Services, Inc, Seattle, Wash. For primary bibliographic entry see Field 07C. W73-06393

DECISION RULES IN CHANCE-CONSTRAINED PROGRAMMING: SOME EXPERIMENTAL COMPARISONS, Norwegian Inst. of Urban and Regional Research, Oslo.

Osio.
For primary bibliographic entry see Field 04B.
W73-06438

KSIM: A METHODOLOGY FOR INTERACTIVE RESOURCE POLICY SIMULATION, British Columbia Univ., Vancouver. J. Kane, I. Vertinsky, and W. Thomson. Water Resources Research, Vol 9, No 1, p 65-79, February, 1973. 5 fig, 8 tab, 6 ref.

Descriptors: "Water policy, "Simulation analysis, "Canada, United States, Decision making, Computers, Education, Methodology, Resources, Mathematical models, Systems analysis. Identifiers: Policy making, Environmental quality, National sovereignty, Geometric simulation, Water sales, Feedback systems, Interaction.

Water sales, Feedback systems, Interaction.

Policy questions involving the use and distribution of water cannot be resolved solely by abstract models that optimize numerical coefficients; human, subjective evaluations must play a prominent role so that mathematical simulations may be interpreted realistically. Presented is a new mathematical language (KSIM) that has been developed and designed for interative team use. Many of its features make it particularly appropriate for use in formulating environmental policy: 1) It can communicate the workings of complex, nonlinear feedback systems to the nonmathematical apecialist; 2) it encourages group interaction and helps focus dialogue between people representing diverse specialities and holding differing viewpoints; 3) it provides for ready entry of such 'soft' subjective variables as environmental quality and national sovereighty; 4) it emphasizes the significance of structural relations rather than numerical prediction; and 5) it is flexible and easily generalized. To illustrate its use, it is shown how KSIM can facilitate discussion of the multiple impacts of possible Canadian water sales to the United States. (Bell-Cornell)

APPLICATION OF DISCRIMINANT ANALYSIS IN DESIGN REVIEW.

IN DESIGN REVIEW, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.

Center. D. G. DeCoursey. Water Resources Research, Vol. 9, No. 1, p 93-102, February, 1973. 5 fig. 8 tab, 13 equ, 9 ref.

Descriptors: *Dams, *Slope protection, *Data, *Design, Reservoirs, Flood control, Upstream, Mathematical models, Systems analysis. Identifiers: *Multivariate discriminant analysis, Separation, Wave damage, Wave protection.

Multivariate discriminant analysis is a technique that uses a group of variables (discriminators) to obtain a maximum separation between different groups of data. The discriminant function (a linear combination of the discriminantors) obtained by this analysis may be used to assign an individual observation to the group that it most nearly resembles. Discriminant analysis is used to analyze factors related to the adequacy of standard slope protection on small dams. The structures are divided into two groups: a group that visibly needs additional slope protection and a group that appears to be designed satisfactorily. The analysis shows that a linear combination of the fetch length, the surface area to length ratio (average width), and the plasticity index of the surface material on the dam can be used to distinguish between the two groups about 85% of the time. The equation defined by these parameters is scaled for cost and number of structures, and can be used to assign structures to the two groups such that the additional protection can be most economically provided. (Bell-Cornell) W73-06440

COMPONENT SENSITIVITY: A TOOL FOR THE ANALYSIS OF COMPLEX WATER RESOURCE SYSTEMS, Maryland Univ., College Park. Dept. of Civil Eagineering. R. H. McCuen.

Water Resources Research, Vol 9, No 1, p 243-246, February, 1973. 2 tab, 17 equ, 7 ref.

Field 06-WATER RESOURCES PLANNING

Group 6A-Techniques of Planning

Descriptors: *Water resources, *Planning, Methodology, Management, *Optimization, Simulation analysis, Computers, Hydrology, Mathematical models, Systems analysis, Model studies. Identifiers: *Component sensitivity analysis, Parameter sensitivity.

Parameter sensitivity.

Sensitivity estimates are valuable for determining an optimal set of model parameters. However, the inadequacy of the mathematical foundation of sensitivity has prevented the use of systematic gradient optimization techniques for the analysis of complex water resource systems and hydrologic simulation models. The computer time required to increment each parameter and to measure the change in output is considered excessive for optimization of complex systems. The use of component sensitivity provides an alternative to the method of parameter perturbation that greatly reduces the computational effort. The mathematical foundation of component sensitivity is introduced, and the method of computation is demonstrated for a two-component system. The mathematical foundation of component sensitivity is easily extended to more complex systems. (Bell-Cornell)

WATERWAY TRANSPORTATION SIMULA-N MODELS: DEVELOPMENT AND APPLI-

TION MODELS: DEVELOPMENT AND APPLICATION,
Pennsylvania Transportation and Traffic Safety
Center, University Park.
J. L. Carroll, and M. S. Bronzini.
Water Resources Research, Vol 9, No 1, p 51-63,

February, 1973. 4 fig, 4 tab, 9 ref.

Descriptors: *Inland waterways, *Transportation, *Simulation analysis, Computer programs, *Mississippi River, *Locks, Channels, Economic efficiency, Planning, Evaluation, Optimum development plans, Systems analysis, Model studies. Identifiers: *Illinois waterway, Navigation improvements, Commodity flows, Fleet characteristics, Tows, Ports, Pools.

ieristics, Tows, Ports, Pools.

In assessing the economic efficiency of improvements to the waterway transportation system of the nation, it becomes increasingly important to scrutinize thoroughly all proposed investments in waterway transportation, both to avoid those projects with insignificant returns and to insure that truly beneficial projects are properly planned, designed, and operated. A computer simulation model that studies the operating characteristics of alternative inland waterway transportation systems is described. The first part of the model processes information concerning commodity flows and waterway fleet characteristics to derive a list of tows that will move on the waterway under study. The second part simulates the movement of these tows through the ports, locks, pools, and channel delay areas comprising the waterway system. Results of applying the model to a 10-lock subsystem on the Illinois waterway and upper Mississippi River are given. The ultimate goal of naulyzing prospective waterway transportation projects in a systems context is to determine which improvements to a given waterway, if any, will result in the least cost to society of transporting goods in the market area served by the waterway. The model developed herein is useful in obwill result in the least cost to society of transporting goods in the market area served by the waterway. The model developed herein is useful in obtaining answers relating to transportation supply functions. The equally important topics of transport demand and the equilibrium of supply and demand must be treated through parametric variation of the simulation inputs, in a truly comprehensive systems analysis methodology integrating the diverse, complex phenomena. (Bell-Cornell) W73-06442

LINEAR DECISION RULE IN RESERVOIR MANAGEMENT AND DESIGN 3, DIRECT CAP-

CITY DETERMINATION AND INTRASEASONAL CONSTRAINTS, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. For primary bibliographic entry see Field 04A. W73-06443

OPPORTUNITY COSTS OF A TRANSBASIN DIVERSION 2. THE COLUMBIA RIVER BASIN, Hawaii Univ., Honolulu. Dept. of Economics; and Hawaii Univ., Honolulu. Water Resources Research Center.
J. E. T. Monacur.
Water Resources Research, Vol 9, No 1, p 43-49, February, 1973. 1 fig, 2 tab, 6 equ, 9 ref.

Descriptors: "Water supply, "Imported water, River basins, "Linear programming, "Dynamic programming, Evaluation, Energy, Irrigation, Water quality, Reach (Streams), Hydrology, Optimization, Mathematical models, Operations research, Washington, Inter-basin transfers. Identifiers: "Columbia River basin, "Opportunity costs," Transhasian diversion, Water releases, Optimal operation, Snake River.

When water supplies of a river basin are drawn on for importation into other regions, the value of services provided by the river to the economy of the water-exporting region will diminish. To estimate the opportunity costs implied by such a transbain diversion, a previous paper developed a linear and dynamic programing model. Herein, the model is applied to the Columbia and Snake rivers in and near Washington state. The model represents the river system as a set of reaches, each of which is operated according to successive proposals determined by a dynamic program and coordinated by a linear program, which is called the master. Energy, irrigation, and water quality are directly accounted for in the model; certain other water products enter only arbitrarily, if at all. Several solutions illustrate that both the time pattern and the location of the diversion are significant factors in determining the magnitude of the opportunity costs incurred by the exporting region. (Bell-Cornell) W73-06444

SEQUENCING OF INTERDEPENDENT HYDROELECTRIC PROJECTS, California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 04A.
W73-06445

WATER QUALITY AND COMMUNITY VIA-BILITY, Iowa State Univ., Ames. Dept. of Economics. R. A. D. Beck. Ph.D. Dissertation, 1972. 199 p, 30 fig, 21 tab, 186 ref. OWRR B-011-IA (2).

Descriptors: *Regional analysis, *Regional development, *Planning, *Water supply, Water resources development, Water quality, Input-out-put analysis, *Simulation analysis, Employment, Capital, Economic efficiency, *Iowa.

A simulation model for the eight-county region surrounding Ottumwa, Iowa, is developed with the objective of providing information and projections for use in planning for agricultural, industrial and public services development, and water management practices. The model contains an output sector with structural characteristics which were derived from an interindustry input-output table. Other sectors contained in the model are employment, capital, water quality, and demographic sectors. The model permits an analysis of major demographic-economic interactions, their relation to present and future water quality and quantity constraints, and their impact on specific sectoral

re-allocation of employment, output, and the supply of public services. In addition to providing a development program for the region as a whole, the model also produces tests of economic efficiency in the water quality sector by generating a set of shadow prices, that is, prices of scarce resources as determined by the constraints. The development of the simulation model and the simulation results and their potential application are discussed in detail. The results of several simulations are reported. (Settle-Wisconsin)

POTENTIAL BENEFITS OF WATER MANAGE-MENT IN THE GRAND PRAIRIE OF ARKAN-

sas Univ., Fayetteville. Dept. of Agricul-For primary bibliographic entry see Field 04B.
W73-06482

6B. Evaluation Process

OF SIMULATION
TO SMALL PROJECT APPLICATION TECHNIQUES TO SMALL PROJECT ANALYSES,
Texas Water Development Board, Austin. System Engineering Div.
For primary bibliographic entry see Field 06A.
W73-05938

INSTITUTIONAL ALTERNATIVES FOR PROVIDING PROCRAMMED WATER AND SEWER SERVICES IN URBAN GROWTH AREAS: A CASE STUDY OF KNOXVILLE-KNOX COUNTY, TENNESSEE, Tennessee Univ., Knoxville. Water Resources Research Center. For primary bibliographic entry see Field 06A. W73-05955

RIVER BASIN FRAMEWORK STUDY, SOURIS-RED-RAINY REGION, MOORHEAD, MIN-NESOTA.
Souris-Red-Rainy River Basins Commission,
Moorhead, Minn.

Available from NTIS, Springfield Va 22151 as PB-209 168 Price \$3.00 printed copy; \$0.95 microfiche. Water Resources Council, Washington, DC, Interim Report US-WRC-0076, January 1, 1971. 45 p, 4 fig, 51 tab.

Descriptors: "Water resources development, "Rivers, "United States, "Canada, "Minnesota, North Dakota, South Dakota, Streamflow, Runoff, Precipitation (Atmospheric), Water quility, Water yield, Water utilization, Water pollution sources, Data collections, Water supply, Flood control, Water rights, Water damand.

Identifiers: Souris River, Red River, Rainy River.

Identifiers: Souris River, Red River, Rainy River.

The Souris-Red-Rainy study (Minnesota, North Dakota, South Dakota) provides broad-scale analyses of water and related land resources problems and furnishes general appraisals of the probable nature, extent, and timing of measures for their solutions. The Souris, Red, and Rainy Rivers are international streams inasmuch as they either form boundary waters or flow from one country to another. As such they are subject to the terms of applicable treaties between Canada and the United States. In the Souris basin, streamflow is normally inadequate to satisfy water needs, and the quality is generally acceptable but not good. During normal years, streamflow in the Red basin is adequate and the quality is generally satisfactory. However, increasing municipal, industrial, and agricultural pollution is degrading the water quality of the Red River main stem. In the Rainy basin, water is abundant, and, with the exception of the Rainy River below International Falls and

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pend.

Shagawa Lake at Ely, its quality is excellent. The average annual natural runoff originating within the Region ranges from 0.2 inches in the western part of the Souris basin to about 10 inches in the eastern part of the Rainy basin. (Woodard-USGS) W73-05979

WATER RESOURCES RESEARCH COORDINA-TION IN NEW ENGLAND, A MULTI-STATE REGIONAL APPROACH, Rhode Island Univ., Kingston. Water Resources

Center.
For primary bibliographic entry see Field 06E.

W73-06017

A SOCIOLOGICAL PERSPECTIVE OF WATER CONSUMERS IN SOUTH FLORIDA HOUSEHOLDS. Florida Univ., Gainesville. Water Resources Research Center. For primary bibliographic entry see Field 06D. W73-06019

HUMAN RESPONSE TO HURRICANE CELIA, Texas A and M Univ., College Station. Environmental Quality Program. R. C. Schaffer, and E. Cook. Environmental Quality Note 8, July 1972, 50 p, 3 fig, 10 tab, 5 photo, 5 ref.

Descriptors: "Attitudes, "Values, "Hurricanes, "Psychological aspects, "Social aspects, Building codes, Warning systems, Disasters, Behavior, "Texas."

'Icaa.
Identifiers: *Hurricane Celia, *Disaster relief, Financial loss prevention mechanism, Public protection programs, Human response, Storm protection, *Corpus Christi (Tex).

tection programs, runnan response, Storm protection, *Corpus Christ (Tex).

This study was designed to determine: attitudes of selected residents toward hurricane Celia and hurricanes generally; the effect Celia had on respondents; what action respondents had taken before, during, and after Celia struck; and post-hurricane attitudes toward public and private preventive and relief programs. The attitudes and concerns of representatives of middle and upper-class or ganizations in Corpus Christi, Texas were studied several weeks after that community had experienced a major hurricane in August 1970. Only a small number of respondents served in a volunteer capacity in evacuation and storm relief after Celia. Most of the preparations they made for storm protection were classified as minor and were relegated to the securing of household, house, and boat property. Respondents suggested various protective programs to limit future storm damage and loss such as stricter building codes and better warning systems. The high socioeconomic levels of the respondents in this study show them to be the type of individuals who usually are found on high levels of community decision-making. In view of their responses, it appears that the present relative effective community action directed toward warning, protection, rescue, and relief of those members of the community unable to take full advantage of the present loss-prevention mechanisms. (Davis-Chicago) W73-06076

A PLAN FOR WATER-SEWER DEVELOPMENT IN THE LAKE-PORTER REGION, INDIANA. Lake-Porter Regional Transportation and Planning Commission, Highland, Ind.

Preliminary report, 1972. 155 p, 13 fig, 44 tab, 3 append.

Descriptors: "Water supply, "Sewerage, "Alternative planning, "Regional planning, Evaluation, Cost analysis, Financing, Budgeting, Short-term planning, Capital, "Indiana, Water quality standards.

dards.
Identifiers: *Lake County (Ind), *Porter County (Ind), Cost effectiveness, Implementation, Capital program.

A basis is presented for Federal certification of water and sewer planning in the bi-county Lake-Porter Region, Northwest Indiana. The present report differs from the earlier master plan for the region in several respects: (1) major alternatives considered are reported, (2) a cost-effectiveness-evaluation strategy is included, (3) developed alternatives are evaluated in terms of cost-effectiveness, (4) financing and implementation strategy are discussed more fully, and (5) a short range capital program is developed. (Davis-Chicago) W73-06077

NIAGARA RIVER ENVIRONMENTAL PLAN, SUMMARY REPORT. Erie and Niagara Counties Regional Planning Board, Grand Island, N.Y.

June 1972, 54 p, 17 fig, 1 chart, 8 photo. HUD

Descriptors: *Environment, *Management, *Planning, Environmental effects, Water poliution sources, Shore protection, Tourism, Land use, Highways, Long-term planning, Short-term planning, New York. Identifiers: *Niagara River, *Environmental goals, Geophysical features.

goals, Geophysical features.

The environmental condition of the Niagara River Corridor is examined in relation to pollution sources, geophysical features, land use and population concentrations, prominent buildings, highways and entrance ways, and tourist activity concentrations. Design concepts were developed to meet environmental problems identified and both short-range and long-range plans formulated to meet the area's environmental goals. Potential roles for government at all levels in managing the river system to carry out the plans were identified and evaluated. The objectives of the study included: survey of Niagara River and its surroundings as an environmental contributor to the economic life of the region and to the personal satisfaction of residents and visitors; identify existing and incipient environmental problems that limit realization of the potential of the River as an environmental resource; define the types of action needed to protect and enhance the essential environmental qualities of the River and its ahores; and delineate the organizational machinery needed for effective implementation of the actions identified. (Davis-Chicago)

TWENTY YEAR WATER AND SEWERAGE PLAN, Capital Region Planning Commission, Baton Rouge, La. For primary bibliographic entry see Field 03D. W73-06079

A REPORT FOR H.U.D. CERTIFICATION FOR WATER AND SEWER FUNCTIONAL PLANNING AND PROCRAMMING FOR THE URBAN PORTION OF THE WACCAMAW DISTRICT OF SOUTH CAROLINA.
Waccamaw Regional Planning and Development Council, Georgetown, S.C.

May 1972, 82 p, 4 tab, 10 maps, 4 append. HUD-SC-04-00-0050-25-20.

Descriptors: *Water supply, *Sewerage, *Cities, Urbanization, Programs, Facilities, Water supply development, Projections, *South Carolina. Identifiers: *Waccamaw District (SC), *Regional planning, Community goals and objectives.

Evidence is presented as to the capability of the Waccamaw Regional Planning and Development Council as the area-wide planning agency for urban water and sewer programs. The Council's activity is not limited to water and sewer planning but introduces the whole multi-faceted charrceristic of regional planning. Existing urban water and sewer facilities and the extent of expansion and improvement needs over the next twenty years are described. Community goals and objectives, the allocation of operational responsibilities, and essential program elements are also discussed. (Davis-Chicago) W73-06080

REGIONAL WATER AND SEWER PLAN (1971-1972).

Ark-Tex Council of Governments, Texarkana, Tex.

February 1972, 50 p, 13 tab, 12 ref.

Descriptors: "Water supply, "Sewerage, "Regional planning, "Drainage systems, Water demand, Future planning (Projected), Comprehensive planning, Facilities, Coordination, Long-term planning, Urbanization, Water quality control, Water resource development, "Arkansas, "Texas. Identifiers: "Storm drainage.

A summary is provided of the existing conditions and future needs and requirements of water and sewerage treatment facilities in the region. The main goals include: (1) to expand and update the existing regional comprehensive development plan for waterworks, sanitary sewerage, and storm drainage to include that additional planning area of the Ark-Tex Council of Governments not previously provided for by earlier plans; (2) to coordinate and update on a region-wide basis those water and sewer planning efforts already accomplished; (3) to establish a long-range areawide water and sewerage plan to meet the needs of both urban and rural citizens throughout the entire Ark-Tex Council of Governments area; (4) to assure the protection and effective utilization of the region's water resources; and (5) to establish an adequate sewerage treatment program for the entire region that will meet both State and Federal standards. (Davis-Chicago)

METROPOLITAN DEVELOPMENT GUIDE, SANITARY SEWERS, POLICIES, SYSTEM PLAN, PROGRAM.
Metropolitan Council of the Twin Cities, Minn.
For primary bibliographic entry see Field 05D.
W73-06038

ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020 - VOL. 1 TEXT, VOL. 2, APPENDURES. Hazen and Sawyer, New York. For primary bibliographic entry see Field 06D. W73-06084

WASTE WATER MANAGEMENT POLICY STATEMENT, MASON COUNTY, MICHIGAN. Mason County Planning Commission, Mich. For primary bibliographic entry see Field 05G. W73-06067

LAND AND WATER POLLUTION FROM RECREATIONAL USE.
National Industrial Pollution Control Council, Washington, D.C.
For primary bibliographic entry see Field 05B.
W73-06091

Field 06-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

AN APPROACH TO A NEW CITY: PALM

COAST, ITT Community Development Corp., New York. For primary bibliographic entry see Field 03D. W73-06092

ENVIRONMENTAL AND ECONOMIC IMPACT OF RAPID GROWTH ON A RURAL AREA: PALM COAST, Southeastern Environmental Services, Jackson-

ary bibliographic entry see Field 03D.

PREPARING OURSELVES FOR THE CITY OF TOMORROW, Doxiadis Associates, Athens (Greece).

C. A. Doxiadis. Environmental Affairs, Vol 2, No 1, p 180-190, Spring 1972. 6 fig, 1 ref.

Descriptors: *City planning, *Long-term planning, *Future planning (Projected), *Decision making, Research and development, Land use, Communi-cation, Computers, Model studies. Identifiers: *Megalopolis, Definition, Commercial

activity.

Any discussion of planning for future cities should begin with an examination of the city's fundamental elements: Nature: Man, as an individual; Society, as man collectivized; Shell-buildings, houses, and other man-made structures; and Networks, physical and managerial, through which society operates. Recent research has documented that the whole urban system of the U.S. has, since the beginning of the 19th century, been in a state of 'dismal decline.' Certain trends which are significant to city planning are identified. Most of the street networks of present day cities will be the same in 2000. There exist basic conceptual problems in attempting to define a city. Commercial interests in land cannot be overlooked, as long as the economic well-being of millions of urbandependent works is to be maintained. The trend is towards a Megalopolis, particularly in the Great Lakes area, which would extend from Miwaukee to Toronto. Land use, commercial activity, and communications systems should begin now to adopt to this ultimate reality. With modern equipment, i.e., computers, alternatives for the future can be tabulated with efficiency. The existence of models allows the changing of basic assumptions and the insertion of new hypotheses. Hopefully, the point has been reached where the highly intricate problem of the city can be presented in a form which permits objective, well-documented decisions. (Strachan-Chicago)

MULTI- AND INTERDISCIPLINARY RESEARCH - PROBLEMS OF INITIATION, CONTROL, INTEGRATION, AND REWARD, California Univ., Davis. Dept. of Sociology; and California Univ., Davis. Div. of Environmental Studies

Policy Science, Vol 3, No 2, p 201-208, 1972. 1 fig, 10 ref.

Descriptors: *Lakes, *Planning, Methodology, Social aspects, Environment, Political aspects, *California.

Social aspects, "California.

Identifiers: "Interdisciplinary research, Bio-physical systems, Social systems, "Lake Tahoe, Environmental quality.

Some of the difficulties of initiating and complet-ing interdisciplinary research involving both bio-physical and social systems are reviewed. Drawing payacta and social systems are reviewed. Drawing on experience as project director of a large inter-disciplinary project concerned with man's en-vironmental effects on Lake Tahoe, a structural analysis is included of the organization of universities which has the effect of inhibiting interdiscipli-nary research. Specific suggestions for the con-duct and design of such projects are made. The political implications of recent changes in national science policy are also reviewed. (Davis-Chicago) W73-06092

WATER MANAGEMENT STUDY, PHASE I, SUMMARY.
Housatonic Valley Council of Elected Officials,
Danbury, Conn.

April 21, 1972, 7 p, 5 tab, 1 fig.

Descriptors: "Water supply, "Water supply development, "Management, Water demand, Population, Projections, Urbanization, Facilities, "Connecticut. Identifiers: "Housatonic Valley (Conn), Popula-

The identification of water needs by population projections and the identification of existing and potential surface water resources in the Housatonic Valley are summarized. Included are saturation population projections for the region; the identification of potential load centers (areas which, due to concentrated populations, will require public water supplies); million gallons-per-day water needs based on the projections; and the identification of existing and potential surface water resources with estimates of their safe yields. (Davis-Chicago) W73-06097

THE REGIONAL WATER SUPPLY AND WATER POLLUTION CONTROL PLANS.
Delaware Valley Regional Planning Commission, Philadelphia, Pa.

DVRPC Report No 4, 1969. 30 p, 4 maps, 7 photos, append. HUD 701 Grant.

Descriptors: "Water supply, "Water pollution control, "Regional analysis, "Cities, Land use, Community development, Regional development, Urbanization, Water resources, Economics, Economics of scale, Facilities, Municipal wastes, Waste water treatment, Sewage treatment, Sewage districts, Water districts, "Pennsylvania, "New Jersey, "Planning, Identifiers: "Philadelphis, "Regional planning, "Metropolitan water resources management.

*Metropolitan water resources management.

The need for regional planning in metropolitan areas is discussed, stressing the pressures and effects of metropolitan developments, the interrelationships of water supply and water pollution control with land use and development, the increasing use of water resources, the opportunity of economies of scale, and the planning process. The preliminary regional water supply plan is outlined and is concerned with the water sources for this region; the location and capacity of all the water withdrawal facilities; the location, capacity, and type of treatment of all water treatment plants; most transmission lines; and the general boundaries of water service areas within the region. The preliminary regional water pollution control plan is described and is concerned with the location, amount and quality of all sewage discharges in the region; the location, capacity, and type of treatment of all sewage treatment plants; the location and capacity of all regional collection facilities; and the general location of service areas in the region. (Davis-Chicago)

PLANNING AND EVALUATION OF MULTIPLE PLANNING AND EVALUATION OF MULTIPLE PURPOSE WATER RESOURCE PROJECTS IN A MULTIOBJECTIVE ENVIRONMENT: AN OVERVIEW AND POST AUDIT ANALYSIS, INTASA, Inc., Menlo Park, Calif. N. V. Arvanitidis, W. L. Powar, R. I. Levey, D. P. Lijesen, and A. Delarue. Available from the National Technical Informa-tion Service as PB-216 898, \$3.00 in paper copy, \$0.95 in microfiche. Final Completion Report, December 1972. 164 p. 17 fig. 16 tab, 69 ref, 4 ap-pend. OWRR C-3251 (No. 3706) (1).

Descriptors: "Multiple purpose projects, "Planning, "Project planning, Assessments, "Evaluation, Economics, Social aspects, "Environmental control, Multiple purpose, Flood control, Water supply, Recreation, "Project posteruluation." evaluation.

Identifiers: Environmental quality, *Post-audit

Multiobjective evaluation is a radical departure from the traditional benefit-cost analysis oriented toward the single objective of national economic efficiency. This study presents the akeleton of a methodology for planning and evaluation of multiple purpose water resource projects within the context of multiobjectives. Evaluation is considered as an integral part of planning to provide continuous feedback for improving existing alternatives and generating new ones. Specific planning objectives, derived from identification of regional needs for the supply of water and related land resources, are proposed as the means focusing the planning effort and providing meaningful norms for performing final evaluations of project indecomposed into two levels: the first oriented toward identifying major impacts due to changes in the level of resource availability and the second toward improving the design effectiveness of certain project aspects. Analysis of project impacts considers that activities change their location and/or intensity their operation due to a difference as compared to no-difference in the level of resource availability. The purposes of flood control, water supply, recreation and environmental analysis of three completed projects exemplify the proposed procedure. Many promising areas of research are identified, ranging from very specific evaluation issues to much broader theoretical concerns.

W73-06191

WATER RESOURCES RESEARCH COORDINA-TION IN NEW ENGLAND, SUPPLEMENTARY TECHNICAL COMPLETION REPORT, Rhode Island Univ., Kingston. For primary bibliographic entry see Field 06E. W73-06207

REVIEW DRAFT, PROPOSED REPORT OF THE NATIONAL WATER COMMISSION, VOLUME I. National Water Commission, Arlington, Va. For primary bibliographic entry see Field 06E. W73-06260

REVIEW DRAFT, PROFOSED REPORT OF THE NATIONAL WATER COMMISSION VOLUME II. National Water Commission, Arlington, Va. For primary bibliographic entry see Field 06E. W73-06261

DEVELOPMENT AND DISPLAY OF MULTI-PLE-OBJECTIVE PROJECT IMPACTS, Purdue Univ., Lafayette, Ind. Dept. of Agricul-tural Economics. W. L. Miller, and D. M. Byers. Water Resources Research, Vol 9, No 1, p 11-20, February 1973. 3 fig, 4 tab, 20 ref.

Descriptors: Water resources, *Project planning, *Decision making, *Investment, *Economic efficiency, Environment, Systems analysis, Model studies, Optimization, *Indiana, Sediments, Phosphorus, Small watersheds.

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Evaluation Process—Group 6B

Identifiers: "Multiple-objective planning, Social objectives, Environmental quality, "Net national benefits, Trade-off functions, West Boggs Creek watershed, Land treatment.

Serious consideration is being given to formally including objectives other than national income in the evaluation of public investments. Weaknesses have been recognized in the single-objective specification of benefit-cost analysis, which emphasizes quantifiable economic aspects. Recognition that important social goals (primarily environmental quality and national economic development) cannot be specified quantitatively or measured in dollars has encouraged the development of multiple-objective planning and evaluation procedures; three general models are discussed. The research presented develops and illustrates composite trade-off functions that can be used to display the relationship between the economic efficiency and environmental quality impacts of investment in a water resource project. A composite trade-off model is applied to analysis of some aspects of environmental quality component (sediment phosphorus) and net national benefits. Study results suggest that it is possible to develop and display the effect of changes in project design on more than one social objective. This display provides information needed by decision makers to select the desired combination of social objectives. (Bell-Cornell)

COST SHARING AND MULTIOBJECTIVES IN COST SHARING AND MULTTOBJECTIVES IN WATER RESOURCE DEVELOPMENT, National Bureau of Standards, Washington, D.C. Technical Analysis Div. H. E. Marshall. Water Resources Research, Vol 9, No 1, p 1-10, February 1973. 1 fig, 3 tab, 12 ref.

Descriptors: "Water resources development, "Cost sharing, "Multiple-purpose projects, "Project planning, "Regional development, Cost, Evaluation, Optimum development plans, Systems analysis, Mathematical models.

Identifiers: Environmental quality, Optimal

The U.S. Water Resources Council has investigated alternative evaluation procedures for planning water resource projects, stemming from the concern that federal agencies should consider other objectives in addition to national economic development in their evaluation of water projects, and from the fact that the increased discount rate on federal and federally assisted water projects makes fewer projects economically justifiable on beaefit-cost grounds. A conceptual method is proposed for planning the nationally optimal project with multiobjectives. Cost sharing rules have not been proposed for the new objectives. The data required for project evaluation with multiobjectives are used to apply a cost-sharing rule that induces local interests to choose nationally efficient projects. The rule is recommended for traditional project purposes and some new purposes. It can be applied to a multiple-purpose project without allocating project joint costs. A ceiling and a floor on local percentage cost shares of 100% and 20% of project costs, respectively, are considered for traditional purposes. Local percentage cost shares of 50% and 100% are considered for allocated to environmental quality and regional development objectives, respectively. (Bell-Cornell)

W73-06359 The U.S. Water Resources Council has in-

DECISION RULES IN CHANCE-CONSTRAINED PROGRAMMING: SOME EXPERIMENTAL COMPARISONS, Norwegian Inst. of Urban and Regional Research, Oalo.

For primary bibliographic entry see Field 04B. W73-06438

KSIM: A METHODOLOGY FOR INTERACTIVE RESOURCE POLICY SIMULATION, British Columbia Univ., Vancouver. For primary bibliographic entry see Field 06A. W73-06439

COMPONENT SENSITIVITY: A TOOL FOR THE ANALYSIS OF COMPLEX WATER RESOURCE SYSTEMS, Maryland Univ., College Park. Dept. of Civil Enering.
primary bibliographic entry see Field 06A. For primary W73-06441

OPPORTUNITY COSTS OF A TRANSBASIN DIVERSION 2. THE COLUMBIA RIVER BASIN, Hawaii Univ., Honolulu. Dept. of Economics; and Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 06A.
W73-0644

REPORT OF THE CITY OF TORONTO WATER DISTRIBUTION SYSTEM,
Toronto Dept. of Public Works (Ontario).
R. M. Bremner. April 8, 1968. 28 p. 1 fig. 3 tab.

Descriptors: "Administration, "Water supply, "Municipal water, "Public utility districts, Financing, Public utilities, Water users, Water utilization, Water rates, Pipelines, Water distribution (Applied), Water delivery, Water metering, Canada, Water demand, Operation and main-

Identifiers: *Toronto (Ontario), Debenture financing, Fire-fighting water system, Leak detection.

The City of Toronto, Ontario, Canada purchases its water from the Metropolitan Corporation and then, through a water utility, sells water to customers within the City. The utility is self-sustaining, charging for water with both flat rates and metered charges along with fire hydraut charges. Recognizing the changing structure of the City, a review of the water system was commissioned to determine its adequacy. A review and summary of the main findings of that study is presented and recommendations are made to Toronto's Commissioner of Public Works. Some nines in the distribution system reportedly are 94 presented and recommendations are made to Toronto's Commissioner of Public Works. Some pipes in the distribution system reportedly are 93 years old. The City covers a total area of 42 square miles, and is considered totally developed with a population of about 700,000. This is expected to increase to 760,000 by 1987. With a 1966 average water consumption 112 mgd, the 1987 consumption is projected to be 152 mgd. Besides providing for this increased demand, the City must also provide for fire protection, an increasingly difficult problem in view of increased highrise building construction. Using a 'pay as you go 'financing system, the City does not resort to issuing debentures. Twenty-one recommendations were presented, including: (1) review of the water system every five years, (2) maintenance of the present high pressure fire fighting system without system expansion, (3) operation of a leak detection program by the City to reduce the present 18 percent level of unaccounted water, and (4) the use of both flat-rate charges and metered charges, with conversion of all apartments in excess of four-plexes that are now on flat-rate systems (Poertner) W73-06459

STUDY OF ECONOMIC IMPACTS OF POLLU-TION CONTROL ON THE IRON FOUNDRY IN-USTRY, PARTS I, II, AND III. Kearney (A. T.) and Co., Chicago, III. For primary bibliographic entry see Field 0SG. W73-06474

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: ALUMINUM, PARTS I, II AND III. Charles River Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-06479.

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: ZINC, PARTS I, II AND III.
Charles River Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-06476

URBAN WATER MANAGEMENT, National Water Commission, Arlington, Va. Engineering and Environmental Sciences Div. For primary bibliographic entry see Field 03D. W73-0647.

WATER QUALITY AND COMMUNITY VIA-Iowa State Univ., Ames. Dept. of Economics. For primary bibliographic entry see Field 06A. W73-06478

AN EVALUATION OF SUBSIDIES FOR WATER POLLUTION ABATEMENT, Clemson Univ., S.C. Dept. of Economics. For primary bibliographic entry see Field 05G. W73-06479

COSTS OF ALTERNATIVE SOURCES OF FARM WATER, Illinois Univ., Urbana. Dept. of Agricultural Economics. For primary bibliographic entry see Field 06C.

THE TELEPHONE INTERVIEW IN LEISURE RESEARCH, Washington Univ., Seattle. Coll. of Forest

Paper presented at the Third World Congress of Rural Sociology, August, 1972, Baton Rouge, Louisiana. 14 p, 24 ref. OWRR A-047-WASH (1).

Descriptors: *Methodology, *Surveys, *Recreation demand, Probability, Sampling.
Identifiers: *Leisure, *Telephone, Interviews,

Completion rate.

The telephone interview may constitute a seriously underrated technique for acquiring baseline data in leisure research. Criticisms of the telephone interview include (1) difficulty in maining a representative sample, (2) female response bias, (3) inability to contact respondents with unlisted numbers and potential respondents without phones, (4) inability to gain respondent rapport, and (5) poor completion rates. Analysis of leisure research conducted via telephone interviews in Washington, Oregon, and California indicates that these problems are not insurmountable. For example, by employing quotas and interviewing from 9:00 A.M. until 10:00 P.M., the problem of female response bias was eliminated. A computer generated the last four digits of telephone numbers called, thus eliminating the problem of unlisted numbers. Non-telephone subscribers constitute only 7 percent of the population sampled, so failure to contact them is not a serious weakness for most purposes. Using professional interviewers the overall refusal rate for eligible respondents was only 12 percent, even though the average interview lasted 20 minutes. This refusal rate is comparable to such rates for personal interviews and somewhate less than the rate normally obtained from mail questionnaires. (Settle-Wisconsin)

Field 06-WATER RESOURCES PLANNING

Group 6B-Evaluation Process

IRRIGATION DEVELOPMENT AND AGRICUL-TURAL ABUNDANCE: CONFLICTING ELE-MENTS IN PUBLIC POLICY TOWARD AGRICULTURE, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 03F. W73-06486

WATER AND SEWERAGE FACILITIES PLAN FOR THE GREATER COLUMBIA AREA. Central Midlands Regional Planning Council, Columbia, S.C. ary bibliographic entry see Field 05D.

REGIONAL WATER AND SEWER GUIDE. Upper Savannah Planning and Development District, Greenwood, S.C.
For primary bibliographic entry see Field 05D. W73-06488

THE ST. LOUIS REGION WATER AND SEWERAGE FACILITIES, East-West Gateway Coordinating Council, St. Louis, Mo.
For primary bibliographic entry see Field 05D.
W73-06491

COMPREHENSIVE SEWER AND WATER PLAN, Mid Columbia Economic Development District The Dalles, Oreg.
R. W. Pearson, F. F. Dinsmore, and R. J. Bartlett.
June 1972, 74 p, 5 fig, 3 map, 10 ref. HUD-LGR-

Descriptors: *Water supply, *Sewerage, *Comprehensive planning, *Oregon, Population, Facilities, Project planning, Priorities, Financing.

The sewer and water plan was divided into five functional areas: (1) the introduction which elaborates upon the conduct of this study, the major concerns of the study, and the committee input to the study; (2) a discussion of the District's characteristics incorporating information dealing with the District's physical, economic, and demographic characteristics plus a short analysis of the District's drainage basins. The drainage basin material was included as a primary step towards a larger study, to be written at a future data, which will evaluate existing water quality standards within the District and relate these standards to the sewer and water facilities which exist in the District; (3) a brief analysis of the existing water and sewer systems; and (4 and 5) material derived from the preceding three subject areas and containing the project proposals for the District and a plan to implement needed sewer and water projects on a prioritized basis. Data concerning local governmental finance, project finance, a time frame for construction, plus the responsible parties for implementation were presented. (Davis - Chicago) W73-06492 larger study, to be written at a future data, which

WATER AND WASTEWATER FUNCTIONAL PLANNING REPORT, FY 1972 South Carolina Appalachian Council of Governments, Greenville.
For primary bibliographic entry see Field 05D.
W73-06493

SEWERAGE AND WATER SUPPLY PLAN FOR LACKAWANNA COUNTY.

Lackawanna County Regional Planning Commission, Scranton, Pa.

For primary bibliographic entry see Field 05D.

VOLUME IV-INVENTORY AND ANALYSIS OF EXISTING WATER SUPPLY SYSTEMS AND POTENTIAL SOURCES OF SUPPLY. Malcolm Pirnie, Inc., White Plains, N.Y. For primary bibliographic entry see Field 03D. W73-06495

REGIONAL PLAN FOR SEWERA DRAINAGE, AND WATER SUPPLY. Clinton Bogert Associates, Fort Lee, N.J. For primary bibliographic entry see Field 05D. W73-06496 SEWERAGE.

ERIE COUNTY PUBLIC UTILITIES STUDY. Erie County Metropolitan Planning Commission, For primary bibliographic entry see Field 05D. W73-06497

WATER RESOURCES IN THE TAMPA BAY RE-GION.
Briley, Wild and Associates, Daytona Beach, Fla.
For primary bibliographic entry see Field 03D.
W73-06499

COMPREHENSIVE WATER AND SEWER PLAN. SHREVEPORT STANDARD METROPOLITAN STATISTICAL AREA, CAD-DO-BOSSIER PARISHES, LOUISIANA. Demopolus and Ferguson, Inc., Shreveport, La. For primary bibliographic entry see Field 05D. W73-06500

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

ECOLOGICAL BENEFITS OF HYDRAULIC DREDGING, Ellicott Machine Corp., Baltimore, Md. For primary bibliographic entry see Field 08C. W73-05941

A SIMULATION OF THE EFFECTS OF DYNAMIC WATER PRICING POLICIES, Nebraska Univ., Lincoln. Dept. of Civil Engineer-M. Gysi

M. Gysi.
Available from the National Technical Informa-tion Service as PB-216 601; \$3.00 in paper copy, \$0.95 in microfiche. Nebraska Water Resources Research Institute, Lincoln, Completion Report, June 1972. 25 p, 5 fig, 12 ref, append. OWRR A-023-NEB (1).

Descriptors: "Water demand, "Water supply, *Pricing, *Water shortage, Probability, *Simula-tion analysis, Computers, Siynthetic hydrology.

The effect of time-varying water prices on the long-run risk of water shortages is studied. A digital simulation model for a hypothetical residential community with a stochastic water supply forms the basis for the study. Prices are allowed to vary as a function of reservoir level, generally rising as reservoir levels fall, although decreasing and constant rates are also tested. These tests suggest that the currently popular declining block rate used by most water utilities is not only poor from a community benefit and social equity standpoint, but is also the poorest from the standpoint of risk of shortages. Even the constant price approach is slightly superior. Varying the price of water in order to reflect its relative value has the greatest effect on reducing the risks of shortages. These risks can be decreased further the price of water in order to reflect its relative value has the greatest effect on reducing the risks of shortages. These risks can be decreased further by employing a schedule of increasing marginal rates. Such rate schedules have the additional advantage of keeping down the cost to the low consumption user. The model's results are valid for any community with a downward sloping water demand curve. (Settle-Wisconsin)

INCORPORATION OF NEW POLLUTION CONTROL. TECHNOLOGY IN PROCESS DESIGN AND CONTROL, Weston (Roy F.), Inc., West Chester, Pa. For primary bibliographic entry see Field 05G. W73-06045

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COMPUTATIONAL RESULTS FOR WATER FOLLUTION TAXATION USING MULTILEVEL APPROACH, APPROACH, Case Western Reserve Univ., Cleveland, Ohio. Systems Research Center. For primary bibliographic entry see Field 05G. W73-06072

REGIONAL ADMINISTRATION AND FINANC-ING OF THE BALTIMORE WATER SYSTEM. Booz-Allen and Hamilton, Inc., Washington, D.C. For primary bibliographic entry see Field 06E. W73-06082

ACID MINE DRAINAGE TREATMENT BY ION EXCHANGE, Culligan International Co., Northbrook, Ill. For primary bibliographic entry see Field 05D. W73-06211

FINANCING STORM DRAINAGE IMPROVE-MENTS, Beck (R. W.) and Associates, Denver, Colo. P. R. Cunningham. P. R. Cunningnam.
Presented to American Public Works Association
Annual Meeting, Minneapolis, Minnesota, September 23-27, 1972. 14 p.

Descriptors: "Financing, "Capital costs, "Urban drainage, "Drainage systems, "Storm drains, "Flood control, Flood damage, Urbanization, Financial analysis, Planning, Cost allocation, Drainage programs, Cost-benefit analysis, Cost analysis, Financial feasibility, Sewers, Sewerage, Public benefits, Public utilities.

Identifiers: "Financing methods, "Drainage service charge."

The hazards of flooding are increasing yearly due to the urbanization in all parts of the country. The resulting flood plain encroachment and the expansion of impervious areas combine to increase the quantity and rate of stormwater runoff. We have the technical tools to control drainage and flooding problems, but two recent destructive floods in this country show that we may be losing ground in the battle against drainage problems. The major reason for this lack of progress is due to the growth of a large number of other municipal problems, construction of local flood control facilities often has been delayed. A common, all-encompassing approach to the problem will result in a successful solution to local flood control and drainage problems. In our current economic philosophy, costs borne by society in the form of a degraded environment are to be transferred to the user of the products that cause such environmental degradation. But it should be recognized that the regional benefits of satisfactory drainage facilities extend beyond those primary factors which are normally considered, and that there are secondary and even tertiary benefits. Furthermore, since rainfall on their land does contribute to some extent to the amount of water which eventually must be drained or controlled, it is justifiable to have a user-charge on all real estate properties. Thus, a service charge could be used for financing such a system by considering lot size, lot development, land slope, location of outlets, and rainfall intensity. Other financing systems include financing through the issuance of bonds, income or sales tax, and grants. (Poertner)

STUDY OF ECONOMIC IMPACTS OF POLLU-TION CONTROL ON THE IRON FOUNDRY IN-DUSTRY, PARTS I, II, AND III. Kearney (A. T.) and Co., Chicago, III. For primary bibliographic entry see Field 05G. W73-06474

THE EFFECTS OF POLLUTION CONTROL ON THE MONFERROUS METALS INDUSTRIES: ALUMINUM, PARTS I, II AND III. Charles River Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-06479.

THE EFFECTS OF POLLUTION CONTROL ON THE NONFERROUS METALS INDUSTRIES: ZINC, PARTS I, II AND III.
Charles River Associates, Inc., Cambridge, Mass. For primary bibliographic entry see Field 05G. W73-06476

AN EVALUATION OF SUBSIDIES FOR WATER POLLUTION ABATEMENT, Clemson Univ., S.C. Dept. of Economics. For primary bibliographic entry see Field 05G, W73-06479

COSTS OF ALTERNATIVE SOURCES OF FARM WATER, Illinois Univ., Urbana. Dept. of Agricultural Economics. C. L. Moore.

C. L. Moore.

In: Proceedings of the Second Allerton Conference, December, 1971, Environmental Quality and Agriculture, Special Publication 26, College of Agriculture, University of Illinois at Urbana-Champaign, p 44-47, 1972. 5 tab, 5 ref. OWRR A-054-ILL (1).

Descriptors: *Water supply, *Costs, Discount rates, Farms, Wells, Ponds, Cisterns, *Illinois. Identifiers: *Alternatives, Present value, Discounting, Washington County (Illinois).

Discounting, Washington County (Illinois).

A survey of 38 residents in rural Washington County, Illinois, was undertaken to determine the costs of water from various sources. The sources employed by the rural residents were (1) deep well, (2) shallow, untreated well, (3) shallow, treated well, (4) ponds, (5) transported water from nearby Hoyleton, Illinois, and (6) cistern. The criterion used for evaluating these alternative sources is the net present value of the cost of providing about 1,740 gallons daily to each farmer over a 20-year period. The present values of the cost of the alternative water sources to one farmer are \$1,271 for shallow well, \$3,013 for untreated pond, \$5,860 for treated pond, and \$32,279 for transported water. These figures are valid for only one or two wells. If more than that are needed, the rankings would be altered. Moreover, since the water coming from many of the wells is of unsatisfactory quality and would most likely require treatment, the rankings may again be altered. Application of the present value criterion would allow one to distinguish among these more complex alternatives. (Settle-Wisconsin)

INDUSTRY EXPENDITURES FOR WATER POLLUTION ABATEMENT, National Industrial Conference Board, New York. For primary bibliographic entry see Field 05G. W73-06481

A NEW APPROACH TO DETERMINING THE PRICE ELASTICITY OF DEMAND FOR DOMESTIC WATER, Clemson Univ., S.C. For primary bibliographic entry see Field 06D. W73-06483

THE COST OF POLLUTION ABATEMENT IN AMERICAN INDUSTRY, Environmental Protection Agency, Washington, D.C. For primary bibliographic entry see Field 05G.

IRRIGATION DEVELOPMENT AND AGRICUL-TURAL ABUNDANCE: CONFLICTING ELE-MENTS IN PUBLIC POLICY TOWARD AGRICULTURE, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 03F. W73-06486

6D. Water Demand

LONG RANGE PLANNING FOR METROPOLITAN WATER SERVICE, Indianapolis Water Co., Ind. System Planning and Development.
M. C. Stout, and J. D. Bakken.
Meeting Preprint No 1888, American Society of Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 139.

Descriptors: "Planning, "Long-term planning, "Municipal water, "Water resources development, "Water supply, Water demand, Surface waters, Reservoirs, Forceasting, Groundwater, Water reuse, Indiana.

Identifiers: "Indianapolis (Indiana).

Indianapolis, Indiana is one of the largest cities in the United States without a major source of water nearby. As early as 1900 it was evident that grounwater supplies would be inadequate for long-range use. The dependable supplies of the natural streams were fully utilized in the early 1940's, and yet, through planning, the City has never been forced to ration or limit the use of water although population has grown from about 170,000 in 1900 to 800,000 in 1970. Planning for long-range growth began in 1896 when the consulting engineer, Allen Hazen, recommended the use of the White River as a source of water supply by means of a canal and a slow sand filter plant. A 1923 report by Metcalf and Eddy showed that the natural supply of water from the White River and Fall Creek would not be sufficient and recommended development of a reservoir came in 1943 and a second reservoir to meet future growth was immediately planned. This reservoir, on a tributary to White River, was completed in 1956. A third and fourth reservoir are now in the planning stage and are expected to be completed by the early 1980's. Besides these reservoirs, groundwater surplies are now being used and it is projected that by 2020 all sources of groundwater, surface water and reclaimed water will need to be put to use. Total consumption in 2020 is expected to be well over double today's use. (Poeriner)

SYSTEMS APPROACH TO RIVER BASIN MANAGEMENT, Washington Univ., Seattle. For primary bibliographic entry see Field 06A. W73-05951

GROUNDWATERS OF THE HERETAUNGA PLAINS, HAWKE'S BAY. Ministry of Works, Wellington (New Zealand). Water and Soil Conservation Div. For primary bibliographic entry see Field 04B. W73-05974 A SOCIOLOGICAL PERSPECTIVE OF WATER CONSUMERS IN SOUTH FLORIDA HOUSEHOLDS. Florida Univ., Gainesville. Water Resources Research Center.

Available from the National Technical Information Service as PB-216 802; 35.00 in paper copy, 80.95 in microfiche. Florida Water Resources Research Center Publication No. 18, 1972. G. A. Watkins, Editor, August 1968. 93 p., 27 tab. 99 ref, 1 append. OWRR A-010-FLA (3). 14-01-0001-1077.

Descriptors: "Water use, "Urban sociology, "Rural sociology, "Attitudes, "Forecasting, Human population, Social values, Domestic water, "Water demand, Water requirements, Water conservation, Municipal water, Water reuse, Psychological aspects, "Florida. Identifiers: West Palm Beach (Florida), Homestead (Florida).

In residential households, relationships between water consumption and certain demographic and social characteristics were ascertainable. The relationships between selected socio-economic variables, household demographic consumption, and household appliance inventories were developed. The household members had measurable degrees of water-use awareness which are related to water-use and the socio-economic status of each household. The same household members had values regarding water conservation, consumption, and waste which were subjected to an attitudinal scale construction to reveal the strength of these values in specific areas. Some basic relationships between the use of water and the several socio-economic characteristics of the households of West Palm Beach and Homestead, Florida were established. (See also W68-00913)

A SIMULATION OF THE EFFECTS OF DYNAMIC WATER PRICING POLICIES, Nebraska Univ., Lincoln. Dept. of Civil Engineering. For primary bibliographic entry see Field 06C. W73-06021

ON A PLAN FOR REGIONAL WATER SUPPLY TO THE YEAR 2020 - VOL. 1 TEXT, VOL. 2, APPENDURES. Hazen and Sawyer, New York.

Report prepared for the Regional Planning Council, Baltimore, Maryland, June 1969, 188 p, 24 fig, 23 tab, 71 ref, 12 append. HUD 701 grant.

Descriptors: "Water supply, "Water supply development, "Regional planning, Regional development, "Water demand, Population, Land use, Water reuse, Recycling, Desalination processed, Hardness (Water), "Maryland. Identifiers: "Baltimore, Metropolitan water resources management.

A discussion of population and land use, present and future water needs, existing water supply systems and quantities of water to be produced, regional water supply development, waste water reclamation and sea water conversion, and a comparison of projects are included. Heavy future water demands and negligible undeveloped water resources in the City of Baltimore, Baltimore County and Howard County indicate the advantages of a central water supply for those areas. The sources of supply best suited to regional development are the Susquehanna River, Deer Creek, and the Potomac River. Conversion of sea water and reclamation of sewage and industrial resources and the product would not be as good. The prospects of low cost desalting and waste water purification within the near future are doubtful. One problem is that the Susquehanna

Field 06-WATER RESOURCES PLANNING

Group 6D-Water Demand

River system has the shortcoming of the hardness and high sulfate content of the river water during dry seasons when the supplementary supply is most needed. (Davis-Chicago) W73-06084

WATER MANAGEMENT STUDY, PHASE I, SUMMARY. Housatonic Valley Council of Elected Officials, Danbury, Coan. For primary bibliographic entry see Field 06B. W73-06097

WATER RESOURCE PLANNING IN SOUTH EAST ENGLAND, Easex River Authority (England). R. B. Armstrong, and K. F. Clarke. Journal of the Institution of Water Engineers, Vol 26, No 1, p 11-46, February 1972. 12 fig, 5 tab, 7 ref, 3 append.

Descriptors: "Water demand, "Water supply development, "Water delivery, "Networks, "Computer programs, "Optimization, Operating costs, Regional analysis, Regional development, Water resources, Planning, Hydrologic aspects, Design flow, Water balance, Resource allocation, Systems analysis, Mathematical models. Identifiers: Transhipment costs, Link design.

A study whose objective was to formulate a development program to meet water supply demands for the next 30 years in South East England is described in detail. The future water needs for a large part of this area can be met most economically by developing resources on a regional scale. How the requirements of the area have been determined and how they may be met from a few major sources via a regional delivery network is described. The resources which could be made available to meet the area's deficiencies and the probable routes for transporting water from sources to demand areas are identified. To explore fully the system potentials and to determine the optimum resource development program, a computer model was developed that provides detailed cost information, presents values of various alternative programs, and investigates the behavior of the network. It consists of five interrelated programs (modules) that perform hydrological computations, link optimization, and costing, and allocation and transhipment functions. The technique of segmented level programming, a type of modular programming, is employed. Metric units are used, and an example program is presented for which sensitivity test results are explained. (Bell-Cornell)

GEOTHERMAL ENERGY: AN EMERGING MAJOR RESOURCE, A. L. Hammond.

Science, Vol 177, No 4053, p 978-980, September 15, 1972. 1 fig, 4 ref.

Descriptors: "Geothermal studies, "Thermal powerplants, "Energy transfer, "Geysers, "Thermal springs, Steam, Subsurface waters, Thermal water, Hot springs, Reviews, Evaluation.
Identifiers: "Geothermal energy.

The earth's heat is a potentially valuable source of energy. Three types of resources are being considered-steam, hot water, and hot rock. At the Geysers in northern California, generating plants that are powered by geothermal steam already produce 180 megawatts of electricity at costs lower than those for comparable plants using fossil or nuclear fuels. Proven sources of hot water are located in California, Newda, New Mexico, Oregon, and Idaho, although none is yet in commercial use, and potential sites have been identified in all of the western states. In Mexico, just south of the U.S. border near Cerro Prieto, a

75-Mw power plant that uses steam separated from hot water is about to begin operation. Hot rock constitutes a third type of resource but one that is more difficult to exploit than steam or hot water. One proposed method of tapping these dry geothermal deposits would be to create artificial cavities by means of conventional or nuclear explosives, and then to circulate water from the surface through the cavity to extract heat from the rock. Conservative estimates are that 100,000 Mw of generating capacity from geothermal power could be developed by the end of this century. (Woodard-USGS)

OPPORTUNITY COSTS OF A TRANSBASIN DIVERSION 2. THE COLUMBIA RIVER BASIN, Hawaii Univ., Honolulu. Dept. of Economics; and Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 06A. W73-06444

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif.

Technical Report, February 1972. 75 p, 5 fig, 70 ref. HUD California P-294 (G).

Descriptors: "Planning, "Regional analysis, "Surveys (Data collections), "Water supply development, "Sewerage, "Land use, California, Forecasting, Water demand, Waste water treatment, Public utility districts, Water pollution control, Regional development.

Identifiers: "San Diego County (California).

The future development of the San Diego Region will depend considerably on the future supply of water and the sewage service available. A survey of both services was undertaken for this region of 4,258 aquare miles and a 1971 population of 1.4 million, which is estimated to grow to 2.35 million by 1990. Major recommendations include: (1) establishment of land-use policies and population goals, (2) regional water resource management, preferably a drainage basin approach, and (3) cooperative planning by local units of government. The San Diego Region uses 254 mgd of municipal water, of which 84 percent is imported from the Colorado River through the Metropolitan Water District of Southern California. With the use of Colorado River water by Arizona, the supply to California will be drastically cut and other water sources have been contracted for. Water treatment and distribution in the San Diego Region both need improvement, requiring large capital expenditures. Sewage treatment is similarly inadequate, with collection systems needing expansion and treatment facilities often operating at or near capacity. Pollution exists from septic tanks and also exists in coastal lagoons, although San Diego Bay itself is free of pollution except from ships. Future water supply development will include waste water reclamation and desalination. (See also W73-06454

WATER DISTRIBUTION AND SANITARY SEWERAGE SYSTEMS BACKGROUND AND POLICY STUDY. San Diego County Planning Dept., Calif.

Summary Report February 1972. 56 p, 1 fig, 70 ref. HUD California P-294 (G).

Descriptors: "Planning, "Regional analysis, "Water supply development, "Sewerage, "Land use, California, Forecasting, Water demand, Waste water treatment, Public utility districts, Regional development, Water pollution control. Identifiers: "San Diego County (California).

The rapid development of the San Diego Region has led to many problems in water supply and sewage treatment and future growth will depend considerably on the ability to provide these services. This report, a companion to a technical report for the region, includes: discussions on the need for regional water and sewer planning, a framework of objectives and principles for policy decisions on water and sewer planning, a explanation of Federal and State water quality programs, and the responsibilities of the San Diego County Comprehensive Planning Organization in the function of a metropolitan clearinghouse. The San Diego Region, which includes all of San Diego County, has an area of 4,258 square miles, a 1971 population of 1.4 million and an estimated 1990 population of 1.3 million and an estimated 1990 population of 2.35 million. There are over 75 public water and sewer agencies in the region, and water consumption is put at 254 mgd, of which 84 percent is imported from the Colorado River. Local governments are increasingly unable to provide for water and sewage. A regional drainage-basin approach to these problems is recommended along with a land-use policy to guide future policy decisions and population goals. (See also W73-06454) (Poertner)

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GROUND WATER GEOLOGY, Pennsylvania Dept. of Health, Harrisburg. Div. of Sanitary Engineering. For primary bibliographic entry see Field 04B. W73-06457

REPORT OF THE CITY OF TORONTO WATER DISTRIBUTION SYSTEM, Toronto Dept. of Public Works (Ontario). For primary bibliographic entry see Field 06B. W73-0649

WASTEWATER COLLECTION, TREATMENT AND DISPOSAL, MID-HUMBOLDT COUNTY URBAN PLANNING PROGRAM. Baruth and Yoder, Walnut Creek, Calif. For primary bibliographic entry see Field 05D. W73-06464

A NEW APPROACH TO DETERMINING THE PRICE ELASTICITY OF DEMAND FOR DOMESTIC WATER, Clemson Univ., S.C.
R. M. Pope, Jr.
Paper, presented to South Carolina Academy of

Paper presented to South Carolina Academy of Science, Economics Section, March 25, 1972, Columbia, South Carolina. 6 p, 6 ref. OWRR B-032-SC (1).

Descriptors: "Water demand, "Prices, "Surveys, Water users, Regression analysis, "South Carolina. Ideatifiers: "Price elasticity, Questionnaire.

Identifiers: "Price elasticity, Questionnaire.

A popular hypothesis holds that after a price increase the price elasticity of demand for domestic water will become smaller with the passage of time. Supposedly, consumers get used to the new, higher rate, and since the expenditure on water is such a small percentage of income, they will return to their previous level of consumption. To date, however, there has been no serious effort to substantiate this widely-accepted hypothesis. An innovative methodology was developed to test this hypothesis, and although the final results of the study are not yet available, the data collection system is briefly described. In order to obtain individual household consumption and selected socio-economic data which would allow for a test of the hypothesis, a sample survey of domestic water users in several South Carolina cities was undertaken. The cities chosen offered two attractions, (1) recent price increases, and (2) cooperations, (1) recent price increases, and (2) cooperations from water management officials. Household information was obtained from water company records and from questionnaires mailed to

selected households. Over 55 percent of the questionnaires were completed and returned. A simple linear regression model will be used to test the hypothesis. (Settle-Wisconsin) w73-06483

6E. Water Law and Institutions

LEGAL ASPECTS OF DEALING WITH CON-TRACTORS,
Tacoma Dept. of Public Utilities, Wash.
P. J. Nolan.
Journal of the American Water Works Association, Vol 61, No 3, p 153-156, March 1969.

Descriptors: *Legal aspects, Construction costs, *Contract administration, Taxes, Documentation, Public utilities, *Bids, Damages. Identifiers: Litigation, *Awarding of contracts, Language (Legal), Subcontracting, Agencies.

Language (Legal), Subcontracting, Agencies.

A general framework of proposed specifications which can be incorporated into a simple contract-form document is given. The document will cross-refer to the specifications and make them a part thereof along with the performance bond. It will not be necessary thereafter to draft new specifications for each proposed improvement; the particulars relating to any proposed improvement can be adapted into a special set of provisions prepared solely by the engineers. It is suggested that, if the engineers find or realize any particular areas where disputes might arise, the assistance of the attorney or legal section should be promptly requested. Otherwise, it will be too late to change the situation after the documents have been executed and circulated. It is emphasized that the success of projects is going to depend largely on the common sense and attention provided by officials charged with administering these matters during a contract's lifetime. (Campbell-NWWA)

FINAL REPORT OF THE PENNSYLVANIA SANITARY WATER BOARD, 1923-1971.
Pennsylvania Dept. of Environmental Resources,
Harrisburg. Bureau of Water Quality Manage-

Publication No. 29, May 1971. 15 p, 2 fig.

Descriptors: *Pennsylvania, *Water pollution con-Descriptors: "Pennsylvania," water poliution con-trol, "Water quality control, "History, "Legisla-tion, Regulations, Municipal wastes, Industrial wastes, Water pollution sources, State govern-ments, Sanitary engineering, Sewage treatment, Sewerage, Law enforcement. Identifiers: "Pennsylvania Sanitary Water Board.

With the signing of Act 275 in 1970, the functions of the Pennsylvania Sanitary Water Board were transferred to the Bureau of Water Quality or the Peinsylvania Sanitary Water Board were transferred to the Bureau of Water Quality Management in the Department of Environmental Resources. The activities are described of the now-defunct Sanitary Water Board since its inception. It provides useful background information and descriptions of programs that are to be continued by the new governmental organization. Water pollution control became a concern of Pennsylvania in 1905 with the passage of the 'Purity of Water Act'. This was followed 18 years later by the creation of the Sanitary Water Board, the first such water pollution control board in the nation. It was vested with the authority to grant permits for sewage treatment and sewer construction; however, it did not have power to control industrial wastes until acts of the Legislature, passed in 1937 and 1945, gave them this power. Through enacting tough legislation and cooperative programs, along with good foresight, much has been accomplished — although much remains to be done. (Poertner) WATER RESOURCES RESEARCH COORDINA-TION IN NEW ENGLAND, A MULTI-STATE REGIONAL APPROACH, Rhode Island Univ., Kingston. Water Resources

Center.
R. W. Hardy.
Available from the National Technical Information Service as PB-216 800, \$5.00 in paper copy, 80.95 in microfiche. Prepared for the New England Council of Water Center Directors, January 1973.
68 p. 1 fig. 3 tabs, 2 charts, 22 ref., 4 append. OWRR C-2034 (No. 3356) (1), 14-31-0001-3356.

Descriptors: *Research and development, *Research priorities, *Coordination, *New En-gland, *Project planning, Institutions, Institutional constraints, Administration, Regional develop-ment, Water resources institute, River basins com-mission, Organizations, Planning, Communica-

tion. Identifiers: Knowledge transfer, Interdisciplinary

The need for coordination on a multi-university basis was analyzed in terms of basic scientific and societal trends. Research coordination was defined as a two-directional and two-dimensional process (1) among members of the scientific community and (2) between the scientific community and (3) between the scientific community and the public primarily government. The basic purpose is to overcome obstacles to the transfer of knowledge. The principal objective of regional coordination is the development of multi-disciplinary and multi-university research programs which address major public problems in a comprehensive and efficient manner and produce applicable results. This requires typically the development of new concepts which stimulate scientific innovation by transcending disciplinary barriers. Three interdependent functional areas for coordination were identified and discussed - information transfer, liaison and research planning. Institutional and administrative problems and alternatives were evaluated. A full-time professional staff as part of a multi-university based management structure associated closely with regional (multi-state) planning agencies is both necessary and feasible to operate a program of coordination. W73-06017

REGIONAL ADMINISTRATION AND FINANC-ING OF THE BALTIMORE WATER SYSTEM. Booz-Allen and Hamilton, Inc., Washington, D.C.

Report prepared for the Regional Planning Council, Baltimore, Maryland, June 15, 1969, 108 p, 2 append. HUD 701 grant.

Descriptors: "Water supply, "Financing, "Regional planning, "Administration, "Legal aspects, "Financing, Jurisdiction, Coordination, Regional analysis, Governments, Cost analysis, Planning, Simulation analysis, Systems analysis, "Maryland Identifiers: "Baltimore, "Interjurisdictional water

The following topics are presented: (1) background and description of the Baltimore Water System, its administration, and the interjurisdictional agreements process; (2) an assessment of the interjurisdictional agreements process; (3) jurisdictional views on the fundamental administrative and financial issues, and a summary and critique of these views; (4) recommendations for administering a Baltimore regional water system, including a basis for assigning financing responsibility and allocating the costs of major new system improvements; and (5) other administrative matters which may require further study, including manpower, legal ramifications of interjurisdictional water supply, and the possible use of simulation techniques and systems analysis in water planning and administration. (Davis-Chicago) W73-00082

PRIVATE RELIEF UNDER THE REFUSE ACT, For primary bibliographic entry see Field 05G.

W73-06096

PUBLIC WORKS AUTHORIZATIONS-C-ONFERENCE REPORT ON S.4018.

Congressional Record, Vol 118, p S17785-S17788 (daily ed) October 12, 1972. 4 p.

Descriptors: "Flood control, "Federal budget, "Erosion control, "Legislation, Bank erosion, Federal government, Annual flood, Soil erosion, Shore protection, Soil water movement, Streambeds, Erosion, Disasters, Appalachian Mountain Region, Annual costs, Annual benefits, Project planning, Regional development, Construction costs, Watershed management, Dam construction, Streamflow.
Identifiers: *Omnibus Rivers and Harbors Flood
Control Act, *Army Corps of Engineers.

Control Act, *Army Corps of Engineers.

The conference report on the Omnibus River and Harbors-Flood Control Act of 1972, (S.4018), authorizes continued federal participation in the development of water resources. The conference report increases from \$100,000 to \$250,000 each the authority for the Army Corps of Engineers to carry out snagging and cleaning projects to streams. The total authorization is increased from \$2 to \$5 million per year. Similar increases were authorized for the Corps to carry out emergency streambank protection projects with the individual project cost limit increased from \$50,000 to \$250,000 and the yearly total for these activities from \$1 to \$5 million. \$4,018 contains provisions directing the Corps of Engineers to report to the Congress regularly on projects that have been authorized for at least 8 years but on which work has not begun. \$6 million is authorized for shoreline erosion studies. A total of \$25 million is authorized to be spent in disaster areas with a maximum of \$2 million to be spent in any one area. Provisions for flood control projects are also included. (Tolle-Florida)

UNOFFICIAL COMPOSITE; GENERAL PER MITTING PROCEDURES FOR COASTAL ZONE ACTIVITIES IN FLORIDA. ZONE ACTIVITIES IN FLORIDA.
Florida Dept. of Natural Resources, Tallahassee.
Coastal Coordinating Council.
For primary bibliographic entry see Field 05G.
W73-06104

NEW ENGLAND INTERSTATE WATER POL-LUTION CONTROL COMMISSION.

Conn Gen Stat Ann secs 25-67 thru 25-68a (Supp

Descriptors: "New England Interstate WPS Compact, "Legislation, "Connecticut, "Interstate commission, "Water quality control, State jurisdiction, Legal aspects, Sewage treatment, Water sampling, Waste treatment, Water pollution sources, Legislation, Water supply, New England, Remedies, Waste disposal, Interstate compacts, Water pollution control, Legal review.

Water poliution control, Legal review.

This legislation deals with the reaffirmance by Connecticut of the New England interstate water pollution control compact in that it authorizes the operation of the New England Interstate Pollution Control Commission in Connecticut. The compact and commission were created in view of the growing need of industry, agriculture, and recreation needs for water of suitable quality in the New England area. The Connecticut legislature has given the commission the power to develop training standards for sewage and waste treatment plant personnel in that state, as well as the duty to establish a water sampling and testing network to determine the quality of Connecticut's water supply. If the commission finds a low level of water quality at or near the state's boundaries, it has the duty to notify the state of Connecticut or

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

any other concerned state. After notification, the commission shall afford appropriate agencies, state or federal, the opportunity to take necessary remedial action. If action is not taken, the commission has the power, following a public hearing, to order that the sources of pollution reduce or cease waste discharges into the affected water. The commission's order is enforceable in any court of competent jurisdiction. (Adams-Florida)

WATER POLLUTION CONTROL. Conn Gen Stat Ann secs 25-54a thru 25-54an, secs 25-54ii thru 25-54qq (Supp 1971).

Descriptors: *Connecticut, *Legislation, *Water pollution control, *Bavironmental control, Pollution abatement, Municipal wastes, Waste disposal, State jurisdiction, Detergents, Water pollution sources, Penalties, Regulation, Financing, Penalties (Legal), Administrative agencies, Adjudication procedure, Legal review, Oil polition, Water law, Permits, Water quality standards.

A commissioner of environmental protection is created who is granted far ranging powers and duties including the development of comprehensive programs for the prevention and control of water pollution. Included is the power to issue orders prohibiting nunnicipalities as well as all persons from discharging wastes into the waters of the from discharging wastes into the waters of the state. If any person or municipality does not comply with an abatement order, the commissioner shall have the state attorney general seek an injunction. Additionally, the commissioner may authorize grants equaling 30% of cost to cities which construct or acquire pollution abatement facilities. The chapter calls for penalties of up to \$1,000 per day for anyone who intentionally violates any of the provisions. The act further bans the sale of detergents containing more than \$.7% of phosphorous by weight. Also included are provisions for waste discharge permits and oil pollution. (Adams-Florida)

ENVIRONMENTAL LAW—RETROACTIVE AP-PLICATION OF THE NATIONAL ENVIRON-MENTAL POLICY ACT. For primary bibliographic entry see Field 05G. W73-06107

PREPARATION OF AN ENVIRONMENTAL IM-PACT STATEMENT, For primary bibliographic entry see Field 06G. W73-06108

ARKANSAS RIVER BASIN COMPACT, ARKANSAS-OKLAHOMA.
Report-Comm on the Judiciary-United States Senate, 92d Coag, 2d Sess, October 21, 1972. 7 p.

Descriptors: "Interstate compacts, "Legislation, "River basin development, "Water pollution control, "Appropriation, Pollution abatement, Reservoirs, State jurisdictions, Water management (Applied), River basins, Eminent domain, Arkansas, Oklahoma, Legal aspects, State governments, Water rights, Public lands, Water utilization, Water distribution (Applied), Water law, Water-courses (Legal aspects). Hendiffers: "Arkansas River Basin, "Congressional hearings, Sovereign immunity."

The Committee on the Judiciary submitted a favorable report, which was accepted by the Seaste, recommending that federal consent be given to the Arkansas River Basin Compact, Arkansas-Oklahoma, S.3316. The Compact provides for cooperation between the states in abating water pollution within the Arkansas River Basin and makes apportionments between the States of the basin waters by specified subbasins. The com-

pact further provides for recognition of the powers and rights of each state; neither state is granted eminent domain rights outside its own borders, though each may build water storage reservoirs in the other. The Department of Justice has written a favorable report, and accepted an amendment to the bill which provides waiver of sovereign immunity from suit against the United States, similed to suits in the Supreme Court arising out of the compact with a signatory state as a party litigant and the United States an indispensable party. (Smith-Adam-Florida)

ENVIRONMENTAL CITIZEN ACTION.

Hearings-Subcomm on Fisheries and Wildlife Conservation-Comm on Merchant Marine and Fisheries, US House of Representatives, 92nd Cong. May 7, June 9, 10, 1971, May 8, June 23, 1972. 620 p. 2 tab, 2 chart.

Descriptors: "Law enforcement, "Legislation, "Judicial decisions, "Remedies, Legal aspects, Water policy, Eavironmental effects, Administration, Water poliution control, Federal jurisdiction, Public rights, Administrative decisions, Water

Identifiers: *Citizen suits, *National Environmen-tal Policy Act, *Congressional hearings, Public trust doctrine.

Hearings were held before the House Subcommittee on Fisheries and Wildlife Conservation of the Committee on Merchant Marine and Fisheries with reference to the possible adoption and recommendation of several pieces of legislation. The proposals include amending the National Environmental Policy Act of 1969 to provide for class actions in the U.S. District Courts against persons responsible for creating certain environmental hazards and to confer standing on private persons to sue for relief from pollution. Contained are reports from the Agriculture Department, Atomic Energy Commission, the Council on Environmental Quality, the Defense Department, the Environmental Protection Agency, the Federal Aviation Administration, and the Department of the Interior. Testimony from a variety of environmental experts is included. Also included is a paprint of a law review article by Joseph Sax on the public trust doctrine and citizen suits. (Mockler-Florida)

SAN FRANCISCO OIL SPILL.

Hearings—Comm. on Merchant Marine and Fisheries—United States House of Respesentatives, 92d Cong, 1st Sess, February 8, 9, 1971. 533 p, 14 fig, 1 plate, 4 map, 17 photo, 7 tab, 3 chart, 3 append.

Descriptors: *Oil pollution, *Oil industry, *Water pollution effects, *Oil spills, Oil, Legal aspects, Water pollicion sources, Pollutants, Environmental effects, Ships, Navigation, Accidents, Water pollution, Oceans. Identifiers: *San Francisco Bay, *Congressional hearings, Coastal waters.

Hearings were held before a special subcommittee of the House Committee on Merchant Marine and Fisheries on the tanker collision of January 18, 1971, in San Francisco Bay between the Arizona Standard and the Oregon Standard and the effects of the resulting massive oil spill. This subcommittee, organized to reflect the broad interests of the full committee, was primarily interested in techniques and procedures for combating oil spills once they occur and, more specifically, the prevention of such marine accidents. Testimony was received from representatives of the Ecology Center Foundation, the Oceanic Society, Gamlen Chemical Company, Sierra Club, University of California, Chevron Shipping Company, California Department of Fish and Game, Coast Guard,

San Francisco Marine Exchange, National Wildlife Health Foundation, San Francisco Bay Pilots Association and the California Inland Pilots Association, among others. Along with their testimony, a great deal of technical and scientific information was produced by these individuals to be incorporated into the record. (Mockler-Florida) W73-06111

IMPLEMENTATION OF THE RESOURCE RECOVERY ACT OF 1970.

Hearing-Subcomm. on Air and Water Pollution-Comm. on Public Works, United States Senate, 92nd Cong. 2d Sess, August 23, 1972. 48 p.

Descriptora: "Legislation, "Recycling, "Solid wastes, "Waste disposal, Pollution abatement, Landfills, Disposal, Ultimate disposal, Environmental engineering, Local governments, Environmental sanitation, Federal government, Administrative agencies, Social aspects, Environmental effects, Water pollution sources, California, Biodesradation degradation. ntifiers: *Congressional hearing, *Resource

This hearing took testimony on the implementa-tion of the Resource Recovery Act of 1970. Recog-nizing the problems of disposing of solid wastes and the valuable materials being lost in disposal, which, if recycled would avoid future shortages and limit degradation of natural resources. Con-gress enacted the Resource Recovery Act of 1970. This Act was intended to reorient federal policy from continued support of disposal to recycling and reuse of resources. Despite this clear mandate treads in recycling are not encouraging. As a guide and reuse of resources. Despite this clear mandate trends in recycling are not encouraging. As a guide for future actions in developing effective solid waste management and resource recovery programs extensive testimony was requested and given by city and county officials of San Diego, California, with respect to the effectiveness of programs developed and instituted to resolve their solid waste management problems. The Committee was impressed with the city's shredding machine which bales the solid waste for disposal. However, it was added that in the future, even this morcess must give way to recycling. (Beardslev-morces) process must give way to recycling. (Beardsley-Florida) W73-06112

SAFETY OF DAMS.

Hearing-Comm. on Interior and Insular Affairs-United States Senate, 92nd Cong, 2d Sess, July 20, 1972. 89 p, 24 ref.

Descriptors: *U.S. Water Resources Council, *Legislation, *Dam design, *Safety, *Inspection, Structural engineering, Water resources develop-ment, State governments, Federal government, Dams, Dam failure, Civil engineering, Regulation, Safety factors, Testing surveys, On-site tests, Governmental interrelations, Dam foundations, Dam construction, *California, Water control. Identifiers: *Congressional hearing.

Testimony was taken on S.3449, a bill to authorize and direct the Water Resources Council to coordinate a national program to insure the safety of dams and other water storage and control structures, to provide technical support to state programs for licensing and inspection of such structures and to encourage adequate state safety laws. Recent flood and hurrican damage points up the fact that in the past there has been little control of the design and construction of dams by state governments. This bill will provide federal expertise to overburdened state water resources staffs to expedite a program of dam inspection. Included is the full text of House Bill S.3449 and California's statutes and regulations pertaining to supervision of dams and reservoirs. (Beardsley-Florida) W73-06113

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House (Rep. No 1972. 3 p Descript tional la diana, B demand, use, Re Conserva

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S.3811 sc acquisitional La Indiana I by an ac 8,329.81 certain at than 9 1/ tional factured already be mount o authoriza possible authorize 2.028.07 bought. 7 project is tion suits ment of th W73-0611

ROUND MANASQ AN ACT TO PROVIDE FOR THE ESTABLISH-MENT OF THE INDIANA DUNES NATIONAL LAKESHORE, AND FOR OTHER PURPOSES.

Public Law No. 89-761, 80 Stat. 1309 (1966), 4 n.

Descriptors: "National lakesbores, "Public lands, "Legislation, "Indiana, "Condemnation, Great Lakes, Beaches, Financing, Federal government, Dunes, Condemnation value, Recreation, Swimming, Land classification, Land appraisals, Zoning, Project planning, Geomorphology, Wildide, Conservation, Eminent domain, Legal

aspects.

Public Law 89-761 was enacted to provide for the establishment of the Indiana Dunes National Lakeshore. It authorized the appropriation of not more than \$27,900,000 for acquisition of land. It also authorized the Secretary of the Interior to acquire lands and water by donation, exchange, or condemnation. The Secretary's authority to acquire property by condemnation was suspended in respect to all one-family dwellings which are used for noncommercial residential purposes when a zoning agency has applied to such property a duly adopted, valid zoning ordinance. Any owner of one-family dwellings which are acquired by the Secretary of Interior may retain the right of use and occupancy on the improved property for a term of 25 years, subject to its continuation of use being restricted to noncommercial purposes. The act further prohibits development of any visitor facilities which would be incompatible with the preservation of the flora, fauna, or physiographic conditions prevailing at the effective date of the act. However, the Secretary may establish trails, observation points and exhibits within the lakeshore to provide for public enjoyment. The act also establishes an advisory commission to remain in effect for a period of ten years from the date of enactment. (Adams-Florida)

AMENDING THE INDIANA DUNES NATIONAL

AMERDING THE INDIANA DUNES NATIONAL LAKESHORE ACT. House Comm. on Interior and Insular Affairs, H Rep. No. 92-1042, 92nd Cong, 2d Sess, August 11, 1972. 3 p.

Descriptors: "National parks, "Public lands, "National lakeshores, "Great Lakes, Lakeshores, Indiana, Beaches, Federal government, Recreation demand, Camping, Water sports, Lakes, Land use, Recreation facilities, Procurement costs, Conservation, Condemnation, Legislation, Recreation, Dunes.

Recreation, Dunes.

S.3811 seeks to increase the amount authorized for acquisition of lands for the Indiana Dunes National Lakeshore from \$27,900,000 to \$32,600,000. Indiana Dunes National Lakeshore was authorized by an act of November 5, 1966, to consist of 8,329.81 acres, created to preserve for public use certain areas of the Indiana Dunes. There are more than 9 1/2 million people living within a 100-mile radius of the Dunes, and when completed the National Lakeshore will provide an important recreational facility to meet projected demands. With funds already appropriated, only 3,333.66 acres have been acquired. Because an insufficient amount of land has been acquired, the lakeshore has not been established six years after the authorization of the project. S.3811 will make possible the establishment of the total area authorized by allowing for the acquisition of 2,028.07 acres of private land remaining to be bought. The main reason why the \$27.9 million authorized in 1966 was insufficient to complete the project is the excess court awards in condemnation suits. The Committee recommended enactment of the bill. (Adams-Florida)

ROUND VALLEY RESERVATION: MANASQUAN AND SOUTH RIVER RESERVA-

TION: ADDITIONAL WATER SUPPLY SITE RESERVATIONS: STATE WATER SUPPLY. N. J. Stats. Ann. secs. 58:20-1 thru 53:22-7 (Supp.

Descriptors: "New Jersey, "Eminent domain, "Water supply, "Water supply development, Legal aspects, Condemnation, Potential water supply, Reservoirs, Water resources, Compensation, Flow rates, Water distribution (Applied), Water flow, Damsites, Dams, Water sources, Reservoir sites.

Reservoir sites.

The New Jersey Commissioner of Conservation and Economic Development is authorized to acquire land which is useful for the future establishment of a water supply system near Round Valley in Hunterdon County. The source will be the Delaware River or the Raritan River, but restrictions are placed on pamping water from the Raritan River into the Round Valley Reservoir when the flow drops below certain minimums. Real property may be acquired by purchase or eminent domain. One million dollars is authorized to acquire lands unthorized to acquire lands necessary for the construction of a tidal barrier dam on South River to protect the Old Bridge water-bearing sand formation from surface and subsurface saltwater intrusion. Another 27 million is authorized for the caquisition of real property for other water supply facilities in various locations. The State Treasurer will pay municipalities a sum equal to that last paid on taxes on any property acquired by the State so that they do not suffer loss. (Ghckman-Florida) W73-06116

WATER AND SEWERAGE PLANTS AND SYSTEMS IN GENERAL; SEWERAGE DIS-TRICTS AND SEWERAGE DISTRICT BOARDS. N.J. Stat. Ann. secs. 58:11-1 thru 58:12-7 (Supp.

Descriptors: "New Jersey, "Sewage disposal,
"Administrative agencies, "Water works,
"Legislation, Water control, State governments,
Water law, Water policy, Water pollution control,
Water pollution, Water pollution sources, Pollution abatement, Penalities (Legal), Public health,
Sewage districts, Waste disposal, Law enforcement, Sludge disposal, Permits, Water purification, Treatment facilities, Water supply, Adjudication procedure.

The State Department of Environmental Protection shall have supervision of all water plants with respect to the purity of potable water, and shall regulate the source of water supplies and approve the plans for water purification plants. The Department shall regulate the physical connection between any potable water supply and unapproved water supply, to assure that it, meets certain standards. The Department must approve of proposed changes in all water and sewerage systems, except those within the jurisdiction of the Passaic Valley Sewerage Commission. Any superintendent or operator of any public water facility must be licensed by the Department. No subdivision may be granted approval by any nunicipality to cover fifty or more realty improvements until the Department certifies that the proposed water supply and sewage facilities comply with regulations. Unless under conditions approved by the Department, no person, corporation or municipality shall build or use any drain or sewerage system from which industrial waste water, municipal waste water, or any harmful substance will flow into the waters of the state. (Glickman-Florida) The State Department of Environmental Protec-

POLLUTION OF WATER.

N.J. Stat. Ann. secs. 58:10-1 thru 58:10-23.33

Descriptors: "New Jersey, "Water pollution control, "Legislation, "Potable water, Water pollution, Public health, Environmental samitation, Water pollution sources, State governments, Regulation, Legislation, Penalties (Legal), Pollution abatement, Waster, Administrative agencies, Water conservation, Water policy, Water quality

control.

No polluting matter can be discharged into any waterway of the state above the point from which any municipality obtains its potable water. There is a penalty of up to \$1,000 for the first violation, or \$3,000 for any subsequent violation. Further, civil suits may be instituted by any political entity or corporation which supplies water to a municipality for injunctive relief from such polluting activities. The discharge of petroleum products, debris and other hazardous substances into the waters of the state is a threat to the environment, and the Department of Environmental Protection is authorized to deal with the damage caused by such discharge. If the party responsible does not remove these substances and the Department must act to contain and remove them, then that party will be liable for the costs incurred. The state must also regulate the dumping of waste materials of the coast of the state. The department may regulate loading of waste materials aboard ship, and require the person in charge of loading to obtain a permit. Violations of the act or any Departmental regulations can result in up to a \$3,000 fine. (Glickman-Florida) W73-06118

NORTH AND SOUTH JERSEY WATER SUPPLY DISTRICTS; ACQUISITION OF RIGHTS FOR NEW OR ADDITIONAL WATER SUPPLY, NJ. Stat. Ann. secs. 38:5-26 thui 38:6-3 (Supp.

Descriptors: *New Jersey, *Water rates, *Water supply, *Municipal water, *Legislation, Public utilities, Water control, Water distribution (Applied), Administrative agencies, State govern ments, Water works, Water law, Regulation Water policy, Water conservation, Water utiliza

Any erroneous cost estimate or prediction by the Water Supply Commission affords a city no legal right to complain about a water supply contract entered into between it and the Commission. The provisions of a contract for fixing rates and prices to be paid for water under the contract must follow the statutory formula and requirements for their determination. A utility may not exercise condemnation powers except where a proper governmental agency having jurisdiction has granted permission. When the agency fails to give any interested party proper notice and hearing, the matter should be referred back to the agency to accord the party an opportunity to be heard. The section providing for the Water Council's approval of the exercise of the right of condemnation by a utility satisfies the requirements of due process. A utility must also obtain approval of plans for construction of new reservoirs and the establishment of new water supplies. (Glickman-Florida)

IN THE MATTER OF GAE FARMS INC. V. DIAMOND (CONSTITUTIONAL CHALLENGE TO STATE ENVIRONMENTAL CONSERVATION DEPARTMENT'S CLASSIFICATION OF STATE WATERS).

337 N.Y.S. 2d 865 (S. Ct. N.Y. 1972).

Descriptors: "Farm wastes, "Water quality stan-dards, "Judicial decisions, "New York, Water pol-lution, Constitutional law, "Public health, Streams, Legislation, Pipes, Sewage, Discharge (Water), Standards, Poultry, Ponds, Animal wastes, Law enforcement, Legal aspects, Water law, Legal review, Administrative decisions, Waste disposal, Water pollution sources, Identifiers: Injunctions (Prohibitory).

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

Petitioner sought review of a determination of respondent Commissioner of Environmental Conservation which assessed a penalty for violations of the Public Health Law and which issued a cease and desist order against further violations of the state water pollution laws. Petitioner operates a poultry farm with three large coops each containing 50,000 hens. Respondent alleged that petitioner had discharged sewage containing chicken manure into a classified tributary of Roundout Creek in contravention of pollution standards for class 'C' waters. Petitioner contended that there was no substantial evidence in the record to support the commissioners' determination. Petitioner also challenged the use of the term 'such waters' in the law as unconstitutionally vague. The court held that testimony establishing the presence of a murky gray liquid in trenches which emptied directly into the stream, together with testimony that sewage was pumped from the coops into these trenches was sufficient evidence to uphold the commissioners' determination. The court also held that use of the term 'such waters' in the law was not unconstitutionally vague when read in the context of Article 12 of the Public Health Law which as a whole make clear which waters are prohibited from being polluted. (Adams-Florida)

BRANDERHORST V. IOWA STATE HIGHWAY COMMISSION (HIGHWAY COMMISSION'S FOWER OF EMINENT DOMAIN DOES NOT EXTEND TO CONDEMNATION FOR RELOCATION OF STREAM).

202 N.W. 2d 38 (Iowa 1972).

Descriptors: *Iowa, *Eminent domain, *Judicial decisions, *Stream flow, *Relocation, Natural flow, Channels, Diversion, Alteration of flow, Streams, Legal aspects, State jurisdiction, Easements, Natural streams, Watercourses (Legal aspects), Water law, Highway relocation, Highway effects, Environmental effects.

Plaintiffs, landowners, brought suit to enjoin defendants, State Highway Commission, from relocating a segment of a creek on their property. The two streams involved in the case have always flowed beneath a highway bounding the plaintiff's property at separate bridges and joined below the highway. To eliminate one of the bridges the Commission sought to bring the streams together above the highway on the plaintiff's land. The defendant contended that it was not proposing to change the natural course of the creek; however, the Supreme Court of lowa held that the defendant was changing the natural course of the stream and that its power of emiment domain did not extend to acquisition of an easement for relocation of the channel of a stream on private property. The court power of eminent domain did not extend to acquisition of an easement for relocation of the channel of a stream on private property. The court stated that permission from the Iowa Natural Resources Council to alter the confluence of the streams did not confer upon the Commission the power of eminent domain, since such authority could only be conferred by the state's legislature. Thus the court enjoined the Commission from so altering the stream flow. (Beardsley-Florida) W73-06121

CONSERVATION; VALIDITY, CONSTRUC-TION, AND APPLICATION OF ENACTMENTS RESTRICTING LAND DEVELOPMENT BY DREDGING OF FILLING,

A. E. Korpela. 46 ALR 1422-1449 (1972). 28 p, 6 ref.

Descriptors: "Legislation, "Wetlands, "Tidal marshes, "Zoning, "Dredging, Flood protection, Legal aspects, Constitutional law, Judicial decisions, Jurisdiction, Water rights, Permits, Land development, Riparian rights, Coastal marshes, Water law.

The validity, construction and effect of statutes, ordinances, or regulations restricting the right of a

landowner to develop his property by dredging or filling are discussed. Statutes, ordinances, and regulations are treated only to the extent that they are discussed in the cases, and the annotation does not purport to reflect the current regulatory provisions of any jurisdiction. Most cases on this subject matter are recent. Following a general comment and background material, sections are devoted to the validity of state dredge and fill control statutes, the due process of law requirements, scope of the police power in this area, the propriety of delegation of power, sufficiency of standards, zoning ordinances or regulations, construction of the statutes, the authority of administrative agencies to deny dredge or fill permits, permit requirement statutes, and individual residential improvement work. Most of these regulatory attempts have not been very successful; courts have frequently held such legislation constitutes an unconstitutional taking of private property. (Mockler-Florida)

WATER SUPPLY: WATER QUALITY MANAGEMENT AND CONTROL. Md. Ann. Code art. 96A secs. 63 thru 71 (Supp.

Descriptors: "Maryland, "Legislation, "Watershed management, "Water quality control, "Water supply, Water quality standards, Water resources development, Recreation, Water supply development, Flood control, Legal aspects, Permits, Water management (Applied), Administrative agencies, Flood protection, Hydroelectric power, Water utilization, Governmental interrelations.

This legislation confers upon the commission established thereunder the power to develop, implement, and effectuate plans and projects for domestic, municipal, agricultural, and industrial water use. Moreover, sweeping general powers are conferred with reference to water quality management and control. This includes specific policies and standards as well as detailed regulations on cooperative administration and enforcement. Duties are also assigned to the commission in reference to flood protection and control, pertaining particularly to the Susquehanna River and its tributaries. Flood lands acquisition authority is granted. The commission is also charged with watershed management, soil conservation, forest management, and the development of water related public sports and recreational facilities. This legislation seeks to preserve and promote other values as well: hydroelectric power development and intergovernmental relations among others. This comprehensive plan covers a variety of water quality management and control programs. The commission is empowered to regulate withdrawals and diversions from surface or groundwaters; provisions for withdrawal permits from protected areas are included. (Mockler-Florida)

WATER RESOURCES: GENERAL PROVISIONS; POWERS AND FUNCTIONS; APPROPRIATION OF WATERS; RESERVOIRS

AND DAMS. Md. Ann. Code art 96A secs 1 thru 20 (Supp. 1971).

Descriptors: "Maryland, "Legislation, "Administrative agencies, "Water resources, "Water management, Reservoirs, Dams, Water sources, Permits, Administration, Water policy, Legal aspects, Water resources development, Appropriation, Water utilization, Diversion structures, Water law, Adjudication procedure.

Powers and duties of the Maryland Department of Natural Resources are enumerated. The purpose of the legislation as well as administrative procedures are discussed. The Department's

powers and functions are listed, including: supervision of development of state waters; authorization to uct surveys, investigations, and studies; and authorization to let contracts for research and scientific investigation. Additional powers and duties allow the Department to take action against the illegal appropriation of state waters and the illegal construction of repair of reservoirs, dams, and saterway obstructions. Permit procedures, hearings, periodic review, correction of permits, and enforcement by injuction, as well as other administrative details, are specifically set forth. The interrelationship between the Department and other state agencies and boards, with reference to powers conferred, is carefully delineated. Limitations imposed on the Department's activities are also established. (Mockler-Florida) W73-06124

RHODES V. POLLUTION CONTROL BOARD (LANDFILL OWNER MAY NOT CLOG FLOODGATE WITH REFUSE). 289 N.E.2d 61 (App. Ct. III. 1972).

Descriptors: "Illinois, "Judicial decisions, "Landfills, "Legal review, "Public health, Law enforcement, Regulation, Administrative decisions, Legal aspects, Administration, Water pollution sources, Standards, Adjudication procedure, State governments, State jurisdiction, sanitary engineering, Solid waste, Waste disposal, Hydraulic structure, Flood control, Floodgates.

Petitioner, landfill owner, brought suit to review an order of the Illinois Pollution Control Board ordering petitioner to refrain from future violations of the rules enacted by the Department of Public Health and imposing a fine. Petitioner contends that he had not violated the rules and the rules were no applicable to his particular site. The Appellate Court of Illinois held that the evidence supported the findings of the Pollution Control Board that petitioner was guilty of violations in that a floodgate near the landfill area was often clogged with refuse and thus incapable of serving its intended function, that petitioner did not confine the dumping of refuse to the smallest practical area, that refuse was not covered daily and that salvage operations at the landfill area were not carried out in a sanitary manner and salvaged materials were not removed from landfill on a daily basis. The Court therefore affirmed the order of the Pollution Control Board. (Beardsley-Florida)

ENVIRONMENTAL LAW-SUBSTANTIVE REVIEW UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT OF 1969,

S. T. Smith.
The North Carolina Law Review, Vol 51, p 145-154. 1972. 52 ref.

Descriptors: "Legal review, "Legislation, "Judicial decisions, "Administrative decisions, "Administrative agencies, Federal government, Comprehensive planning, Environmental effects, Administration, Estimated costs, Estimated benefits, Environmental control, Decision making, Legal aspects, Water law, Law enforcement. Identifiers: "National Environmental Policy Act.

Section 102 of the National Environmental Policy Act of 1969 (NEPA) establishes procedural requirements for governmental agencies wherever a federal activity will have a major impact on the environment. Agencies comply with section 102 of NEPA, but are reluctant to honor the spirit of the Act as set forth in section 101's declaration of policy. Under section 102 a court may review an agency's decision but only to the extent of determining if procedural requirements are met. Environmentalists contend that section 101 should be construed to allow substantive court review of agencies' actions. A leading case denied substantive review under section 101, holding that the Act

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This i state claims mean The p the m it was which limits court review to procedural aspects of NEPA. On the other hand, two recent decisions have held that a court may reverse a substantive agency decision which has been based on an arbitrary balance of costs and benefits, or on insufficient consideration of environmental factors. Section 101 should be interpreted as providing substantive court review when agencies fail to fully consider the environmental impact of their projects. (Adams-Florida) W73-06127

CITIZENS FOR CLEAN AIR, INC. V. CORPS OF ENGINEERS, UNITED STATES ARMY (VALIDITY OF CONSTRUCTION PERMIT WHERE CORPS OF ENGINEERS FAILED TO EVALUATE ENVIRONMENTAL IMPACT OF WATER INTAKE AND DISCHARCE SYSTEM).

349 F. Supp. 696 (S.D. N.Y. 1972).

Descriptors: "United States, "Judicial decisions, "Electric power production, "Administrative decisions, Generators, Decision making, Legal aspects, Water pollution sources, Heated water, Permits, Air pollution, Electric power demand, Legislation, Dredging, Navigable waters, Administration, Environmental effects, Fish management, Public rights, Fish passage, Recreation demand, Federal jurisdiction.

Identifiers: "National Environmental Policy Act, 1969. Injunctions (Prohibitory). Licenses, En-1969, Injunctions (Prohibitory), Licenses, E. vironmental impact statement, Standing (Legal).

vironmental impact statement, Standing (Legal). Suit was brought by plaintiff private citizens organization to challenge the validity of a construction permit for a water intake and discharge cooling unit issued to a power company by the defendant Corps of Engineers. The plaintiff claimed that the National Environmental Policy Act of 1969, (NEPA), was violated by the permit issuance because no comprehensive environmental study had been made in accordance with same. The District Court accepted jurisdiction, saying that it did not appear that plaintiffs did not meet the \$10,000 jurisdictional amount; it held that plaintiffs did have standing to sue, quoting Federal Rule 8 (f) as requiring pleading construction to do substantial justice, and requested an amendment to plaintiff's complaint to render pleadings of standing explicit. The Court held that NEPA did require consideration of environmental values at all stages of such construction and that consideration of administrative delay would not suffice to strip the section of its fundamental importance. Plaintiff's were entitled to summary judgment and an injunction issued pending adherence to the NEPA by the Corps of Engineers. (Smith-Adam-Florida)

STATE EX REL MCLEOD V. MURRELL'S INLET CAMP AND MARINA, INC. (TITLE DISPUTE OVER LAND LYING BETWEEN MEAN HIGH AND LOW WATER MARKS).

192 S.E.2d 199 (S.C. 1972).

Descriptors: "Intertidal areas, "South Carolina, "High water mark, "Wetlands, "Judicial decisions, Tidal waters, Tidal marshes, Riparian rights, Marshes, State jurisdiction, Legal aspects, Inlets, Atlantic Ocean, Salt marshes, Boundary disputes, Boundaries (Property). Identifiers: "Public trust doctrine, Evidence, Jury

This is an appeal in a title dispute between plaintiff state and defendant landowner in which plaintiff claimed title to certain lands as lying between the mean high water mark and mean low water mark. The primary issue in dispute was the position of the mean high water mark; appellant state claimed it was above the area which defendant had filled which would make the disputed lands tidelands and thus belonging to the plaintiff. The Supreme

Court of South Carolina affirmed the lower court, holding that the issue of determining the mean high water mark was a question of fact for the jury; the jury had decided that the land was above the high tide line. The court also affirmed the lower court's decision to exclude two plats from evidence, where they bore no reasonable relationship to the determination of the high water mark. Land which is covered only occasionally by spring tides and other unusually high tides is referred to as a high marsh and is not owned by the state. Thus the court affirmed the judgment for defendant landowner. (Smith-Adam-Florida)
W73-06129

SOLID WASTE DISPOSAL.

Mass. Ann. Laws ch. 16 secs. 18 thru 24 (Supp. 1971).

Descriptors: *Massachusetts, *Legislation, *Solid wastes, *Wastes disposal, *Sanitary engineering, State governments, Public health, Municipal wastes, Industrial wastes, Landfills, Community development, Administrative agen-ments, Cost allocation, Cost sharing.

A Bureau of Solid Waste Disposal in the Massachusetts Department of Public Works is authorized. The Department is authorized to dispose of solid wastes, from whatever source, in any manner and at any site which is concurred in by the Department of Natural Resources and the Department of Public Health. The Department is authorized to study solid waste disposal needs, conduct hearings and reviews, and designate regional disposal districts. The Department also assesses local governments for the disposal of solid wastes originating within such localities. Creation, disposition and expenditures within the Solid Waste Disposal Fund are outlined. Also involved is the method of maintaining records of costs, assessments of municipalities and determination of charges. (Tolle-Florida)

DECLARATION OF NONNAVIGABILITY FOR PENN'S LANDING DEVELOPMENT. Senate Comm. on Commerce, Senate Rep. No. 92-1302, 92d Cong., 2d Sess, October 14, 1972. 8 p.

Descriptors: "Navigable rivers, "Non-navigable waters, "Pennsylvania, "Delaware River, Urban redevelopment, Projects, Marinas, Tourism, Federal government, Coast Guard regulations, Channels, Permits, Rivers, Federal jurisdiction, Legislation, Rivers and Harbors Act. Identifiers: "Congressional hearings, Fill permits, Navigational servitude."

Navigational servitude.

The Penn's Landing project is an urban renewal program designed to rehabilitate the waterfront area of Philadelphia, Pennsylvania, by constructing tourism-related facilities on landfilled portions of the Delaware River. S.1971 would declare this portion of the river nonavigable water. The federal government holds a navigation servitude on all navigable water in the U.S. Section 10 of the Rivers and Harbors Act of March 3, 1899, prohibits filling in the channel of any navigable water without permit authorization by the Secretary of the Army. Even if a permit is granted, the fill is still subject to the navigational servitude and may be ordered removed by the U.S. without payment of compensation. The effect of a declaration of nonnavigability is to remove the title cloud resulting from the servitude, and to make it possible for the project developers to obtain financing and title insurance. The Secretary of the Army recommended amending the bill so that the declaration of nonnavigability would apply only to that point of the river actually filled, leaving the remaining open water in the Penn's Landing area still subject to federal laws governing navigable waters. (Adams-Florida)

WATER RESOURCES RESEARCH COORDINA-TION IN NEW ENGLAND, SUPPLEMENTARY TECHNICAL COMPLETION REPORT, Rhode Island Univ., Kingston.

Rhode Island Univ., Kingston.

R. W. Hardy.

Prepared for New England Council of Water
Center Directors, December 1972. 32 p, 6 ref, 2 exhibits. OWRR C-2034 (No. 3356) (2). 14-31-00013356.

Descriptors: *Research and development, *Research priorities, *Coordination, *New En-gland, *Project planning, Institutions, Institutional constraints, Administration, *Regional develop-ment, Water resources institute, River basins com-mission, Organizations, Planning, Communica-

Identifiers: Knowledge transfer, Research planning, Interdisciplinary research.

planning, Interdisciplinary research.

A four month effort to implement the recommendations of an earlier report 'Water Resources Research Coordination in New England' is described and evaluated. The analysis draws specifically on the step by step development of a multi-university study project on New England lakes to be sponsored by the New England Council of Water Center Directors. The project will consist of a team of researchers drawn from both the physical and social sciences. The initial detailed planning phase of most regional problem solving research projects requires that a team of investigators develop unique study designs and appropriate study strategies which include public participation. This phase is a crucial research task in its own right but is generally preceded by a preliminary, more informal, phase of identifying important problem areas. The coordinator's catalytic role is particularly crucial during these two phases of program development. In addition the managerial evolution from a feasibility study phase to an operational phase for regional research coordination based on the experiences in New England is traced. (See also W73-05852)

REVEGETATION AUGMENTATION BY REUSE OF TREATED ACTIVE SURFACE MINE DRAINAGE - FEASIBILITY STUDY, NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div. For primary bibliographic entry see Field 05D. W73-06209

REVIEW DRAFT, PROPOSED REPORT OF THE NATIONAL WATER COMMISSION, VOLUME I. National Water Commission, Arlington, Va.

Available from the National Technical Informa-tion Service as PB-212 993, \$6.00 in paper copy, \$0.95 in microfiche. Report NWC-72-061, November 1972, 478 p.

Descriptors: "Water policy, "Water resources, "Institutional constraints, "Decision-making, "Water law, "Planning, "Water rates, "Water utilization, Pricing, Water supply, Water consumption, Cost allocation, Pollution taxes (Charges), Federal government, Water pollution control, Flood plain management, Water reclamation, Research and development, Values, Water reuse, Recreation, Inland waterways.

Identifiers: "National Water Commission, "User charges, Public participation.

In this draft report, which the National Water Commission proposes to submit to the President and the Congress in 1973, the Commission presents its tentative findings and recommendations for future water policy. Primary thrust of the recommendations is that beneficiaries of Federal water resources projects should pay the full costs thereof, except where the national interest requires that a certain program should be subsidized for a limited period of time to achieve some national goal. The report rejects the 'no

Field 06-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

discharge' goal of the Federal Water Pollution Control Act amendments of 1972 and urges a more realistic definition of water pollution, related to present and future uses of the body of water. Over 200 recommendations cover such subjects as flood plain management, elimination of the 160-acre limination of the Federal reclamation laws, user charges on inland waterways, strengthening the Water Resources Council, improving water research and development programs, ground water management, resolution of differences between environmental and developmental values, water reuse, water-based recreation, and many other aspects of future water policy. (See also W73-06260)

REVIEW DRAFT, PROPOSED REPORT OF THE NATIONAL WATER COMMISSION VOLUME II. National Water Commission, Arlington, Va.

Available from the National Technical Informa-tion Service as PB-212 994, \$9.00 in paper copy, \$0.95 in microfiche. Report NWC-72-062, November 1972, 694 p.

Descriptors: "Water policy, "Water resources, "Institutional constraints, "Decisionmaking, "Water law, Pricing, Water supply, Cost allocation, Pollution taxes (Charges), Federal government, Water pollution control, Flood plain management, Water reclamation, Research and development, Valves, Water reuse, Recreation, Inland waterways, Water consumption. Identifiers: "National Water Commission, "User charges Public neutricipation." charges, Public participation.

Contents (Chapter headings): making better use of existing supplies; interbasin transfers; means of increasing water supply; better decision-making in water management; improving organizational arrangements; water problems of metropolitan areas; federal-state jurisdiction in the law of waters; sharing the costs of water development projects; financing water programs; and basic data and research for future progress. (See also W73-06260) 06260) W73-06261

WATER POLLUTION: SOUTH PLATTE RIVER, Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 05G. W73-06391

6F. Nonstructural Alternatives

LANDFORMS, HARTFORD NOS QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D. C. For primary bibliographic entry see Field 07C. W73-05976 NORTH

WATER AND SEWER FACILITIES PLANNING PROGRAM, MADISON, ST. CLAIR AND MON-ROE COUNTES, PHASE II, WATER AND SEWER SYSTEMS ANALYSIS. Southwestern Illinois Metropolitan Area Planning Commission, Collinsville.

Available from the National Technical Informa-tion Service as PB-211 317, \$18.50 in paper copy, \$0.95 in microfiche. May 1972. 311 p, 17 fig, 68 tab.

Descriptors: "Planning, "Forecasting, "Water supply development, "Municipal water, "Sewerage, "Illinois, Land use, Flood plain regu-lation, Water resources management, Data collec-tions, Future planning (Projected), Water demand, Sewage treatment, Population, Cities, Identifiers: Municipal water facilities.

This report is the second phase of a three part series on a water and sewer facilities planning program for Madison, St. Clair and Monroe Counties, Illinois. It analyzes the data collected on existing and proposed water and sewer facilities as presented in Phase I of the study and attention is focused on present and future system adequacy. Objectives of the Commission for this region include: (1) extension of service areas in support of planned growth, (2) consolidation of facilities whenever feasible, (3) the achievement of federal and state water quality standards, (4) development of a regional plan, and (5) development of water systems capable of achieving a minimum fire rating of Class 8 on a scale of ten. The area's population is expected to grow from, 554,000 in 1970 to 1,100,000 in 2010. Water supplies, mainly the Mississippi River and wells, are seen as adequate to meet this demand. At the present time, 67 percent of the area's population is served by sewers. The use of septic tanks is to be discouraged in urbanized areas. Flood plain management and stormwater drainage are recommended as measures for controlling water pollution. (Poertner)

6G. Ecologic Impact of Water Development

APPLICATION OF SIMULATION TECHNIQUES TO SMALL PROJECT ANALYSES, Texas Water Development Board, Austin. System Engineering Div. TO OF Engineering Div.
For primary bibliographic entry see Field 06A.
W73-05938

THE GREAT SALT CONTROVERSY, For primary bibliographic entry see Field 05B. W73-05970

NIAGARA RIVER ENVIRONMENTAL PLAN, SUMMARY REPORT. Erie and Niagara Counties Regional Planning Board, Grand Island, N.Y. For primary bibliographic entry see Field 06B. W73-06078

WATER, MAN, AND NATURE, A SYMPOSIUM CONCERNING THE ECOLOGICAL IMPACT OF WATER RESOURCE DEVELOPMENT. Bureau of Reclamation, Denver, Colo

For sale by the Superintendent of Documents. U.S. Government Printing Office, Washington, D.C. 20402 Price \$0.50. Cosponsored by American Institute of Biological Sciences, held at Colorado State University, Ft. Collins, August 30-31, 1971.

Descriptors: "Ecology, "Water resources develop-ment, "Environmental impact, Recreation, Reser-voirs, Planning, Thermal powerplants, Wildlife habitats, Waterfowl, Data collections, Reservoir construction, Ecosystems, Biomes, Biota, Con-servation, Education, Ethics, Values, Cost analy-Identifiers: *Ecological impact, Reservoir ecolo

Proceedings of a symposium on the ecological impact of water resource development are summarized. Eight basic topics were discussed: what ecological information is necessary and how should it be used in water resource planning; ecological impact of recreation at reservoirs; effect of water resource operations upon the environment; ecological impact of atmospheric water resource development; ecology of reservoirs; effect of water resource development upon wildlife and waterfowl habitats; ecological and environmental impacts during construction operations; and ecological effect of coal-fired power-

plants. Several general conclusions were made: there is a need for expanded research and data col-lection: water resource development planning should be a multi-disciplinary activity; ecologists should be brought into water resource planning at the very beginning; long term ecological research will be necessary; conclusions and data collected will be necessary; conclusions and data collected from one ecosystem area may not be easily applied to another ecosystem; engineers need a wider range of environmental recommendations from ecologists; research is needed for developing models of complex ecosystems; research on basic reservoir ecology is needed to classify reservoirs on the basis of biomes; effects of hydroelectric power generation on downstream biota and habitat need to be examined; long term studies to determine changes in biota up and downstream from reservoirs after impoundment are needed; research is needed to determine the effect of fluctuating water levels on the littoral zone; it is necessary to develop a better informed public; water resource managers should develop a conservation ethic and outlook toward resource development. (Davis-Chicago)

ENVIRONMENTAL LAW-RETROACTIVE AP-PLICATION OF THE NATIONAL ENVIRON-MENTAL POLICY ACT. For primary bibliographic entry see Field 05G. W73-06109

PREPARATION OF AN ENVIRONMENTAL IM-PACT STATEMENT, B. C. Kross. University of Colorado Law Review, Vol 44, p 81-147, 1972. 1 fig. 1 tab. 134 ref.

Descriptors: *Decision making, *Legislation, *Federal project policy, *Administrative decisions, *Administrative agencies, Environmental effects, Project benefits, Project feasibility, Engineers estimates, Judicial decisions, Legal review, Legal aspects, Social impact, Reconomic impact, Recreation, Cost-benefit analysis, Cost analysis. Identifiers: National Environmental Policy Act, Environmental Impact Statement.

Environmental Impact Statement.

The most notable development of the National Environmental Policy Act has been the prominence of section 102 (2) (c), which imposes the environmental impact statement requirement on all major federal actions significantly affecting the quality of the human environment. As stated in the Act and in supplemental guidelines from the Council on Environmental Quality, federal agencies through the use of environmental impact statements must openly discuss the details of a proposed action, predict the environmental impact of the action, describe and evaluate alternatives, and seek comments from other federal and state agencies and the public before approving or performing the proposed action. The process which goes into the preparation of an environmental impact statement is described. Also included is an analysis of the process with a critical discussion of some of the problems which exist in this legislations are included: (1) commitments made in the impact statement should be legally enforceable; and (2) impact statement should be readily available to the public, preferably through the lead agency, at no charge. (Tolle-Florida)

THE QUALITY OF COASTAL WATERS: FIRST ANNUAL PROGRESS REPORT. Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 05G. W73-06259

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Data Acquisition—Group 7B

AQUATIC PLANT CONTROL PROGRAM STATE OF TEXAS, (DRAFT ENVIRONMEN-TAL STATEMENT). Army Engineer District, Galveston, Tex. For primary bibliographic entry see Field 04A. W73-06315

ENVIRONMENTAL CONCERN AT LAKE TAHOE, A STUDY OF ELITE PERCEPTIONS, BACKGROUNDS, AND ATTITUDES, California Univ., Davis. For primary bibliographic entry see Field 05G. W73-06498

07. RESOURCES DATA

7B. Data Acquisition

THEORY OF AQUIFER TESTS, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F.

A THERMAL FLOWMETER FOR MEASURING VELOCITY OF FLOW IN A WELL, Geological Survey, Washington, D.C. H. T. Chapman, and A. E. Robinson. Water-Supply Paper 1544-E, 1962. 12 p, 5 fig, 1

Descriptors: Wells, *Water wells, *Flow measurement, *Flowmeters, Heat, Heat transfer, Aquifer characteristics, Aquifer testing, Thermal proper-ties, Hydraulic structures, Boreholes, Well data, "Electrical equipment, Electrical wiring. Identifiers: "Vertical flow, Thermistors, Wiring

A small flowmeter for measuring the rate of verti-cal flow in a well has been developed by the U.S. Geological Survey. The flowmeter is based on the principle of heating the water with an electrical heater and measuring the temperature difference between a point below and a point above the between a point below and a point above the heater. The meter gives accurate results when measuring velocities of 1 to 20 feet per minute. A laboratory constructed well, in which the vertical velocity could be controlled from 1 to 130 fpm, was used for testing several thermal sensing units. Each sensing unit required individual calibration due to difference in electrical components in the construction of each unit. Some modifications such as centering and flow-channeling devices would also be required for adaptation to field use. Velocity determinations in velocity ranges higher than 20 fpm have not been completely reliable, but enough work has been done to indicate that satisfactory results could be obtained by redesigning the heating element for more thorough mixing ing the heating element for more thorough mixing of heated water. In addition to flow velocity, flow direction could also be detected with a properly designed sensing unit. (Smith-NWWA) W73-05910

REMOTE SENSING FOR EVALUATING FLOOD DAMAGE CONDITIONS—THE RAPID CITY, SOUTH DAKOTA FLOOD, JUNE 9, 1972, South Dakota State Univ., Brookings. Remote Sensing Inst. V. I. Myers, F. A. Waltz, and J. R. Smith. Report 72-11, June 1972. 29 p, 17 fig.

Descriptors: *Remote sensing, *Flood damage, *Aerial photography, *South Dakota, *Flood pro-tection, Instrumentation, Cameras, Infrared radia-tion, Floods, Evaluation, Methodology, Hydraulic structures, Dams. Identifiers: *Rapid City (\$ Dak), Structural

Up to 14 inches of rain fell in a short period on the Rapid Creek Watershed above Rapid City, South Dakota, on June 9, 1972. The heavy rains resulted in severe flooding of Rapid Creek which flows through the heart of Rapid City. Walls of water washed out roads, bridges, damaged numerous houses, trailer homes, and businesses and completely destroyed many structures including Canyon Lake Dam. The resulting death toll was in excess of 200 people. On June 11 the flood-damaged areas were photographed at 4,000 feet above ground level with Ektachrome color infrared films (70 millimeter width), and with thermal infrared. The photos have 60% overlap for stereo viewing. From the photographs, procedures for evaluation of general damage were established for houses, trailer homes, businesses, apartments, and public buildings. The evaluation criteria for structures included six categories: (1) no indication of damage; buildings. The evaluation criteria for structures in-cluded six categories: (1) no indication of damage; (2) slight damage noted; (3) medium damage noted, structure still on foundation; (4) structure ap-parently moved off foundation; (5) structure demolished; and (6) foundation, no building. Pictures abow examples of the six damage categories. W73-05984

CALIBRATION AND MAINTENANCE EX-PERIENCE WITH AN OCRANOGRAPHIC AND METEOROLOGICAL DATA ACQUISITION SYSTEM FOR LARGE NAVIGATION BUOYS, Coast Guard, Washington, D.C. Office of Research and Development. J. A. McIntosh.

Available from the National Technical Informa-tion Service as AD-742 659, \$3.00 in paper copy, \$0.50 in microfiche. Final Report, May 1972. 49 p, \$3.50 fig. 14 erg.

Descriptors: "Maintenance, "Electronic equipment, "Water temperature, "Conductivity, "Current meters, "Calibrations, "Fouling, Corrosion, Buoys, Monitoring, Equipment, Mechanical equipment, Evaluation, Currents (Water),

nts to measure air temperature and pressure, wind speed and direction, water temperature and conductivity, and current speed and direction were installed on a large, unmanned buoy, together with equipment to telemeter the data ashore. On shore, a terminal was installed to ashore. On shore, a terminal was installed to receive, store, and display the data. The purpose of the installation was to gain experience with in-strumentation of this type. To date the installation is about four years old. The installation and opera-tion of the instruments on an unmanned buoy presented no problems and did not interfere with the buoy's primary purpose, that is, as a platform for various marine aids to navigation. Except for the problems of marine fouling and corrosions for various marine aids to navigation. Except for the problems of marine fouling and corrosion, which may well have been solved by the use of copper-plated plastic exterior housings, the equipment mounted on the buoy required little maintenance. The trend of the calibration data obtained indicated that annual re-calibration of the meteorological instruments would be more than addenute. The maintenance of the above terminal adequate. The maintenance of the shore terminal adequate. The maintenance of the shore terminal required far more effort than had been anticipated. The equipment involved was so complex that even under optimum conditions, it was estimated that it would require attention for an average of about two hours per week by a skilled and knowledgeable technician. The shore terminal for an operational system with the same instruments as presently used could (and should) differ from the reputative in one of two ways. Fither is could be presently used could (and should) differ from the prototype in one of two ways. Either it could be much simpler and cheaper, or a terminal similar to the existing one could be used to interrogate and process the data from a much larger number of sensors on each of several buoys. (Little-Battelle) W73-06004 DEVELOPMENT OF A METHOD TO DETER-MINE ORTHO-, PYRO-, AND TRIPOLY--PHOSPHATE IN SEDIMENT, Missouri Water Resources Research Center, Columbia. ary bibliographic entry see Field 05A. For primar W73-06035

THE PRESENT AND FUTURE ROLE OF IN-STRUMENTATION IN WATER POLLUTION CONTROL. For primary bibliographic entry see Field 05G. W73-06071

RAPID DETECTION SYSTEM FOR OR-GANOPHOSPHATES AND CARBAMATE IN-SECTICIDES IN WATER. Midwest Research Inst., Kansas City, Mo. Life Services Div. For primary bibliographic entry see Field 05A. W73-06075

A RAPID METHOD FOR SIZE ANALYSIS OF COARSE SEDIMENTS, Instituto Nacional de Limnologia, Santa Fe (Ar-For primary bibliographic entry see Field 02J. W73-06159

EXPERIMENTAL ERROR IN PEBBLE ROUND-NESS DETERMINATION BY THE MODIFIED WENTWORTH METHOD, Texas Univ., Austin. Dept. of Geology. For primary bibliographic entry see Field 02J. W73-06162

THE DESCRIPTION AND MEASUREMENT OF SEDIMENTARY PARTICLES AND THE CON-CEPT OF FORM, Cambridge Univ. (England). Dept. of Geography. For primary bibliographic entry see Field 02J. W73-0616

LIMITS ON THE ACCURACY OF INFRARED RADIATION MEASUREMENTS OF SEA-SU-RFACE TEMPERATURE FROM A SATELLITE, National Environmental Satellite Service, RFACE TEMPERATURE FROM A SATELLITE, National Environmental Satellite Service, Washington, D.C. C. Braun. Available from Springfield, Va 22151 COM 72-10898 Price \$3.00 printed copy; 95 cents microfiche. Technical Memorandum NESS 30, December 1971. 28 p, 5 fig, 7 tab, 28 ref, append.

Descriptors: "Water temperature, "Sea water, "Air-water interfaces, "Remote sensing, "Infrared radiation, Satellites (Artificial), Analytical techniques, Correlation analysis, Evaluation. Identifiers: "Sea-surface temperature.

Identifiers: *Sea-surface temperature.

Discussed is the accuracy with which measurements of sea-surface temperature can be made through a cloud-free atmosphere with either a single- or two-channel radiometer. The single-channel radiometer is assumed to operate in one of three infrared spectral regions. The limits on accuracy are set by the presence of uaknown amounts of ice crystals near the tropopause in a layer thick enough to absorb infrared radiation but too thin to detected visually. The two-channel radiometer is assumed to operate in two infrared spectral regions to eliminate the effects of atmospheric water vapor absorption. The method compensates for atmospheric water vapor absorption about as well as the single-channel measurements, but without the need for separate measurements of atmospheric temperature and water vapor profiles. A radiometer with at least four spectral channels is needed to correct for absorption and re-emission caused by atmospheric water vapor and whatever ice-crystal layer is present. (Woodard-USGS)

Field 07—RESOURCES DATA Group 7B-Data Acquisition

THE REDOX LOG, For primary bibliographic entry see Field 08G. W73-06193

A RESUME OF SPONTANEOUS POTENTIAL MEASUREMENTS, Teton Exploration Drilling Co., Casper, Wyo. For primary bibliographic entry see Field 08G. W73-06195

NEUTRON ACTIVATION FOR ELEMENTAL DETERMINATION IN BOREHOLES, Dresser Atlas, Houston, Tex. For primary bibliographic entry see Field 08G. W73-06196

AN INVESTIGATION OF PERMEABILITY, POROSITY, AND RESIDUAL WATER SATURA-TION RELATIONSHIPS, Chevron Research Co., La Habra, Calif. For primary bibliographic entry see Field 08G. W73-06198

A METHOD FOR RAPID AND RELIABLE SCRAPING OF PERIPHYTON SLIDES, Geological Survey, Menlo Park, Calif. L. J. Tilley.
In: Geological Survey Research 1972, Chapter D; U S Geological Survey Professional Paper 800-D, p D221-D222, 1972. 1 tab, 9 ref.

Descriptors: *Sampling, *Periphyton, *Laboratory equipment, Water quality, Laboratory tests, Analytical techniques.

The use of clean glass alides as a scraping tool proved to be a fast and efficient method for removal of periphyton collected on clean glass substrates. Average time to remove 99.8% of the periphyton from a slide was 1 1/4 minutes. Use of glass slides as substrates permits rapid and accurate checking of removal efficiency. (Knapp-USGS) W73-06223

RAPID FIELD TECHNIQUE USING SPRAY AD-HESIVE TO OBTAIN PEELS OF UNCON-SOLIDATED SEDIMENT, Columbia Univ., New York. Teachers Coll. For primary bibliographic entry see Field 02J. W73-06241

DEUTERIUM AS A TRACER OF REGIONAL GROUND-WATER FLOW, SOUTHERN GREAT BASIN, NEVADA AND CALIFORNIA, Geological Survey, Arlington, Va. For primary bibliographic entry see Field 02F. W73-06251

REMOTE SENSING FOR WATER RESOURCES, Georgia Inst. of Tech., Atlanta. Dept. of Civil En-

eering, Vol 43, No 2, p 35-39, February

Descriptors: "Remote sensing, "Aerial photography, Hydrogeology, Water resources, Data collections, Soil mechanics, Rock mechanics, Electromagnetic waves.

Remote sensing is the evaluation of the geotechnical features of a site without setting foot on the ground. It includes direct aerial viewing, aerial photographs, infrared photographs, thermal imagery and side looking airborne radar. The techniques are the logical succession to air photo interpretation that has proved so useful in identifying the extent and character of soil and rock formations. Some typical applications include locating faults, dikes, folds and similar geologic fea-

tures, identifying joint patterns, zones of un-derground solution, caves and high porosity in bedrock formations, pinpointing surface and shal-low subsurface drainage, and locating problem areas such as muck pockets and shallow bedrock. The techniques are useful in project planning and preliminary site evaluation, particularly where short schedules, large sites, or inaccessible terrain discourage more direct methods. (Knapp-USGS) W73-06255

WATER EQUIVALENT OF SNOW SURVEYS USING NATURAL TERRAIN RADIATION, EG and G, Inc., Arlington, Va. A. E. Fritzche, and Z. G. Burson. Available from NTIS, Springfield, Va 22151 EGG 1183-1495, Price \$3.00 printed copy; 95 cents microfiche. EG and G Report 1183-1495 (Technical Report L-1013), November 23, 1970. 112 p, 38 fig, 15 tab, 9 ref, 6 append.

Descriptors: *Snow cover, *Water equivalent, *Radioactivity techniques, *Aircraft, On-site investigations, Snowmelt, Snow surveys, Hydrologic data, Data collections, Remote sensing, Instrumentation, Analytical techniques, Runoff, Forecasting.

Sensitive radiation detectors have been used for many years for monitoring terrestrial or airborne radioactivity using instrumented aircraft. Since measurable, natural radioactivity in the soil is reduced by an overlayer of water, it is possible to measure the water equivalent of anow cover by sensitive radiation detectors, based either in an aircraft or in portable units on the ground. The first major field tests over snow courses (in the U.S.) to determine the economic and technical practicality of using this technique as an operational system for hydrologic forecasts are described. Multiple arrays of NaI crystals were used in the Aerial Radiological Measuring Surveys (ARMS) system for the airborne measurements. A single 4 x 4 inch NaI crystal in a portable unit was used for ground surveys. Equivalent water of the snow cover was measured by the snow tube technique. The accuracy of predicting the equivalent water in snow from the ARMS aircraft varied from 17% to 30% for deep to shallow snow, respectively. The accuracy on the ground (utilizing the portable unit) was much the same. (Woodard-USGS) W73-06256 Sensitive radiation detectors have been used for W73-06256

INSTRUMENTATION FOR A RADIOECOLOGI-CAL STUDY OF THE HUMBOLDT BAY MARINE ENVIRONMENT, California Univ., Livermore. Lawrence Liver-more Lab. For primary bibliographic entry see Field 05B. W73-06295

PULSED SOURCE-TIME RESOLV PHOSPHORIMETRY, Florida Univ., Gainesville. Dept. of Chemistry. For primary bibliographic entry see Field 05A. W73-06309 RESOLVED.

DISTRIBUTION SYSTEM ANALYSIS BY DIGITAL COMPUTER, Howard Humphreys and Sons, Cons. Engrs., England. Humphreys (Howard) and Sons, Reading (England). For primary bibliographic entry see Field 04A. W73-06353

THE JIMSONDE - A HIGH RESOLUTION TEM-PERATURE SENSOR, National Aeronautics and Space Administration, Huntaville, Ala. George C. Marshall Space Flight

Journal of Geophysical Research, Vol 76, No 36, p 8613-8620, December 30, 1971. 8 fig, 11 ref.

Descriptors: "Air temperature, "Measuring instru-ments, "Remote sensing, Air environment, Air cir-culation, Testing procedures, Heat transfer, Design data, Research and development, Radiosondes, Electronic equipment. Identifiers: "Jimsonde, Jimsphere, Instrument design modifications, Error evaluation.

design modifications, Error evaluation.

The Jimsonde is part of the FPS-16 radar Jimsphere system which is used by the Aerospace Ravironment Division for studies in upper air turbulence and temperature. It is a temperature sensor and the complete system includes the Jimsonde unit, which is fastened to the Jimsphere and a ground unit, which receives and records data. Details of design and performance are given for the Jimsonde and recent modifications are discussed. An error analysis of the unit is made in which errors in heat transfer and calibration are discussed. Both the transfer and calibration are discussed. Both the transfer and calibration are discussed. Both the transfer and calibration errors are considered to be negligible. It is found in a comparison of the Jimsonde with the radiosonde, that the Jimsonde is the more accurate and responsive instrument. It yielded good data from 80% to 90% of the time during 150 flights, and the Jimsonde gives a much more detailed temperature profile, especially in the lower portions of the atmosphere. Error analysis shows it to have an ruserror of 0.41 C at sea level and 0.56 C at 18 km. It is believed the Jimsonde will prove to be a valuable tool in further atmospheric studies. (Jerome - Vanderbilt)

W73-06371

DENDROCLIMATOLOGY AND DENDROCCOLOGY, Arizona Univ., Tucson. Lab. of Tree-Ring Research. H. C. Fritts Quat Res (N Y). Vol 1, No 4, P 419-449. 1971. Illus. Identifiers: *Climatology, *Dendroclimatology, Ecology, Models, Review, Statistics, *Tree rings.

Successful applications of dendroclimatology and dendroecology depend upon careful stratification. Ring-width samples are selected from trees on limiting sites, where widths of growth layers vary greatly from one year to the next and autocorrelation of the widths is not high. Rings also must be cross-dated and sufficiently replicated to provide precise dating. This selection and dating assures that the climatic information common to all trees, is large and properly placed in time. The random error or nonclimatic variations in growth, among trees, is reduced when ring-width indices are averaged for many trees. Some basic facts about the growth are presented along with a discussion of important physiological processes operating throughout the roots, stems, and leaves. Certain gradients associated with tree height, cambial age, and physiological activity control the size of the growth layers as they vary throughout the tree. These biological gradients interact with environmental variables and complicate the task of modeling the relationships linking growth with environment. Biological models are described for the relationships between variations in ring widths from conifers on arid sites, and variations in temperature and precipitation. These climatic factors may influence the tree at any time. Conditions preceding the growing season sometimes have a greater influence on ring width than conditions during the growing season, and the relative effects of these factors on growth vary with latitude, altitude, and differences in factors of the year, but important at other times of the year, but important at other times. differences in factors of the site. The effects of some climatic factors on growth are negligible during certain times of the year, but important at other times. Climatic factors are sometimes directly related to growth and at other times are inversely related to growth. Statistical methods are described for ascertaining these differences in the climatic response of trees from different sites. A practical example is given of a tree-ring study and

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is desc ganic organi ble in ous or vapor not se tion e betwe tractic select extrac the mechanics are described for stratification and selection of tree-ring materials, for laboratory preparation, for cross-dating, and for computer processing. Several methods for calibration of the ring-width data with climatic variation are described. Several examples of applications of tree-ring analysis of problems of environment and climate are described. Other methods of comparing present climate with past climate are described along with new developments in reconstructing past hydrologic conditions from tree rings.—Copyright 1972, Biological Abstracts, Inc. W73-05373

PALLMANN METHOD FOR MASS SAMPLING OF SOIL, WATER, OR AIR TEMPERATURES, Pennsylvania State Univ., University Park. Dept. of Geology and Geophysics. P. J. O'Brien.

Geological Society of America Bulletin, Vol 82, No 10, p 2927-2932, 3 fig, 6 ref. October 1971.

Descriptors: "Temperature, "Measurement, Geophysics, Analytical techniques, Air tempera-ture, Water temperature, Soil temperature, Instru-mentation, Chemical reactions, On-site investiga-tions, Sampling. Identifiers: "Pallman method, Sucrose break-down, Mean temperature data.

The Pallmann solution method, which relies upon the irreversible breakdown of sucrose sugar into simpler forms is an effective way of measuring temperatures in large areas over extended periods. Since optical concentration ratios are proportional to chemical concentration ratios are proportional to chemical concentration ratios, the rate of breakdown can be discovered by periodic polarimeter readings of the solution. Thus, the mean temperature to which the solution was exposed is determined. Although some inaccuracy results from minor laboratory and field measurement problems, it is considered small. A field study conducted in the Mohawk River Valley, during the winter of 1968-69, shows the usefulness of this method. (Jerome - Vanderbilt) The Pallmann solution method, which relies upon

EXTRACTION AND CONCENTRATION OF OR-GANIC SOLUTES FROM WATER, Geological Survey, Deaver, Colo. Water Resources Div. M.C. Goldberg, L. DeLong, and M. Sinclair. Analytical Chemistry, Vol 45, No 1, p 89-93, January, 1973. 3 fig., 2 tab.

Descriptors: "Water properties, "Solvent extrac-tions, "Immiscibility, "Solutes, Analytical techniques, Laboratory tests, Equipment. Identifiers: "Organic solutes, Hexane, Chloroform, Carbon tetrachloride, Benzene, Or-

An organic extraction and concentration apparatus is described that will separate and concentrate organic materials from water. It employs any given organic solvent as long as that solvent is immiscible in water, and it will concentrate a given aqueous organic solvent up to a factor of 100,000 with the stipulation that the solute partitions between water and the organic solvent. The differential in vapor pressure between solute and solvent does not seem to be a factor that regulates concentration efficiency. The dipole moment difference between solute and solvent will indicate the extraction efficiency and can be used as an index to select the extraction solvent. For broad spectrum select the extraction solvent. For broad spectrum extraction, several solvents can be used either in a series or parallel extractor trains; and with adequate dipole moment differences between solvents, the extractor train will selectively concentrate on the basis of solute-solvent dipole moment match. (Woodard-USGS)

7C. Evaluation, Processing and Publication

COMPUTER PROGRAMMING FOR FLOW OVER SIDE WEIRS, Southampton Univ. (England). Dept. of Civil Engineering. gineering. For primary bibliographic entry see Field 08B. W73-05961

LINK BETWEEN STOCHASTIC AND PARAMETRIC HYDROLOGY, Pittsburgh Univ., Pa. Dept. of Civil Engineering. Por primary bibliographic entry see Field 02A. W73-05964

SURFACE-WATER INVESTIGATIONS AT BAR-SURFACE-WATER INVESTIGATIONS AT BAR-ROW, ALASKA, Geological Survey, Anchorage, Alaska. S. H. Jones. Geological Survey Basic-data report, November 1972. 16 p. 7 fig. 4 tab.

Descriptora: Streamflow, Snowmelt, *Water quality, *Alaska, *Basic data collections, Hydrologic data, Gaging stations, Runoff, Discharge measurement, Flow rates, *Water temperature, *Specific conductivity. Identifiers: *Barrow (Alaska).

The Public Health Service is currently developing plans for a long-term water supply and sewage treatment system for the village of Barrow, Alaska. This basic-data report summarizes the streamflow data collected by the U.S. Geological Survey from June 1 through July 10, 1972, at three gaging stations in the Barrow area and discusses the future data collection recovers. The series was Survey from June 1 through July 10, 1972, at three gaging stations in the Barrow area and discusses the future data-collection program. The gaging stations were installed prior to apring breakup, to determine the runoff into Eastkuat Lagoon from Esatkuat Creek, the outflow from Esatkuat Lagoon, and the runoff from the Emaiksoun Lake drainage. Specific conductance and water temperatures were also measured periodically at each gaging-station site. The runoff in gallons for the period of record was 78,870,000 for Nunavak Creek; and 173,100,000 for Esatkuat Lagoon outlet. The minimum specific conductance value (micromhos) for all three sites was 80 at Nunavak Creek; the maximum was 2,000 at Esatkuat Lagoon outlet. (Woodard-USGS)

GROUND-WATER OCCURRENCE IN NORTHERN AND CENTRAL PARTS OF WESTERN COLORADO, Geological Survey, Deaver, Colo. For primary bibliographic entry see Field 04B. W73-05973

LOW-FLOW CHARACTERISTICS OF INDIANA STREAMS, Geological Survey, Indianapolis, Ind. For primary bibliographic entry see Field 02E. W73-05975

LANDFORMS, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D. C. R. M. Barker.
For sale by USGS, Washington, DC 20242 Price - cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map 1-784-H, 1972. 1 sheet, 1 map, 2 ref.

Descriptors: "Geomorphology, "Mapping, "Land development, "Connecticut, Topography, Flood plains, Terraces (Geologic), Slopes, Gullies, Ci-ties, Land development, Planning, Engineering

Identifiers: *Hartford north quadrangle (Conn).

This map (scale 1:24,000) is intended to serve as an aid in evaluation of landforms and can be used to identify areas of potential land development in the Hartford north quadrangle, Connecticut. Various colors on the map represent areas of flood plains; level to gently aloping terrace plains bordered by narrow bluffs; level to gently rolling sandy plains bordered by fairly steep gullied slopes; gently undulating plains, rolling, guilled land of low relief; strongly undulating plains; elongate, smooth low hills; natural conditions severely altered by man over wide areas; sand-dune hillocks; and escarpment. (Woodard-USGS) W73-05976

NATURAL LAND SLOPES, HARTFORD NORTH QUADRANGLE, CONNECTICUT, Geological Survey, Washington, D.C. R. M. Barker, and C. S. Stone. Available for sale by USGS, Washington, DC 20242 Price - 75 cents. Geological Survey Miscel-laneous Geologic Investigations Maps, Map I-784-I, 1972. I sheet, I map.

Descriptors: *Slopes, *Topography, *Geomorphology, *Mapping, *Connecticut, Land development, Planning, Cities, Engineering structures. Identifiers: *Hartford north quadrangle (Conn).

A map (scale 1:24,000) of Hartford north quadran-gle, Connecticut, shows natural land-slope data. Various colors represent areas of slopes less than 3 percent, 3-8 percent, 8-15 percent, and 25-45 per-cent. (Woodard-USGS) W73-05977

MAP SHOWING WATERCOURSES AND AREAS INUNDATED BY HISTORIC FLOODS IN THE MORRISON QUADRANGLE, JEFFER-SON COUNTY, COLORADO,

Geological Survey, Washington, D.C. G. R. Scott.

G. R. Scott. For sale by USGS, Washington, DC 20242, Price-75 cents. Geological Survey Miscellaneous Geologic Investigations Maps, Map 1-790-F, 1972. 1 sheet, 1 map, 2 ref.

Descriptors: "Floods, "Flood data, "Historic floods, "Flood plains, "Colorado, Mapping, Hydrologic data, Land development, Construction, StreamStox, Streamflow, Identifiers: "Jefferson County (Colo), Morrison quadrangle (Colo)

quadrangie (Coto).

A map (scale 1:24,000) of the Morrison quadrangle, Jefferson County, Colorado, shows water-courses and areas inundated by historic floods. In this area, intense summer rainstorms cause flash floods of variable magnitudes. Temporary inundation of land in and adjacent to watercourses during such floods is a natural process. Consequently if buildings, bridges, or roads are placed in watercourses, they are subject to the hazards of flooding. Furthermore, if these structures reduce the area through which water must flow, the degree of the hazard is increased. All watercourses shown on the map, plus unmapped smaller watercourses, are probably subject to flash flooding during high-intensity rainfall. Rainfalls of 8 inches in less than 24 hours have been reported. (Woodard-USGS)

TIDAL CORRECTIONS PROGRAM, Naval Oceanographic Office, Washington, D.C. L. H. Robertson. Available from NTIS, Springfield, Va 22151 AD-873 342 Price \$4.50 printed copy; \$0.95 microfiche. Informal Report IR 70-27, April 1970. 42 p, 5 fig.

Descriptors: *Tides, *Data processing, *Computer programs, *Oceanography, Systems analysis, Input-output analysis, Methodology, Diurnal.

Field 07-RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

Identifiers: *Tidal corrections, Tide tables, High tide. Low tide.

A program that will compute tide corrections from high- and low-water predictions was written for the CDC 3100 Computer. Predicted tidal corrections are used primarily in reducing soundings to an approximate common tidal plane, prior to obtaining observed tidal corrections. In the event tidal observations are not feasible, as with surveys of limited extent and where time does not permit, predicted corrections are used for the reductions of soundings. Normally, the preparation of tidal corrections for field surveys represents a time-consuming task which allows a great deal of human error. By using automation, the chance for error is very remote, provided all input data connuman error. By using automation, the chance for error is very remote, provided all input data con-tains no errors. The final product obtained from automation is an improvement over manual methods, considering time, cost and accuracy. By using automation methods, it takes approximately 3 hours to obtain a finished product of 30 days of tidal information, as compared to approximately 2 to 3 days using manual methods. (Woodard-USGS) USGS) W73-05985

A SIMULATION OF THE EFFECTS OF DYNAMIC WATER PRICING POLICIES, Nebraska Univ., Lincoln. Dept. of Civil Engineer-For primary bibliographic entry see Field 06C. W73-06021

APPLICATION OF A DIGITAL HYDROLOGIC SIMULATION MODEL TO AN URBANIZING WATERSHED, Clemson Univ., S.C. Water Resources Research For primary bibliographic entry see Field 04C. W73-06028

THE DETECTION AND MAPPING OF SUBTER-RANEAN WATER BEARING CHANNEL, Missouri Water Resources Research Center, Rol-For primary bibliographic entry see Field 04B. W73-06034

HYDROLOGIC SIMULATION: BRANCH OF THE CHICAGO RIVER. NORTH Northeastern Illinois Planning Commission, ary bibliographic entry see Field 02E.

AN ESTIMATE OF SEDIMENT SIEVING TIME FROM COMPUTER SIMULATION, Virginia Univ., Charlottesville. Dept. of Environntal Sciences.

primary bibliographic entry see Field 02J.

TRAVEL TIME FOR SOLUTES, UPPER SABINE RIVER BASIN, TEXAS, APRIL 16-30, UPPER 1972, Geological Survey, Washington, D.C. W. B. Mills.

Geological Survey open-file report 1972. 2 sheets, 2 fig, 2 tab, 2 ref.

Descriptors: "Streamflow, "Flow characteristics, "Dye releases, "Texas, Fhorscent dye, Tracking techniques, Discharge measurement, Maps, Water quality, Hydrographs, Hydrologic data, Data collections, Travel time. Identifiers: "Sabine River basin (Tex).

The U.S. Geological Survey, in cooperation with the Sabine River Compact Administration, con-ducted time-of-travel studies using Rhodamine

WT dye in the Sabine River basin, Texas, on April 16-30, 1972. One study was made on the main stem of the Sabine River in four reaches from Lake Tawakoni to Toledo Bend Reservoir, a distance of 19 miles. Two other studies were made on reaches of Lake Fork Creek and Big Sandy Creek. The purpose was to provide travel-rate data to be used by the Sabine River Authority of Texas in constructing a hydrologic model of the basin. The average velocity in the Sabine River showed an overall increase from 0.33 fps in the upstream reach to 0.81 fps at the downstream end, even though the velocity fluctuated between adjoining reaches. Average velocities in the tributary streams ranged from 0.08 fps to 0.30 fps. The higher velocities occurred after runoff from the storm on April 27 entered the streams. Maps, tables, and hydrographs summarize the data on two sheets (approximately 17 x 21 in). The data include locations of sampling sites, water quality, profiles and average velocity of dye peaks, and shape of the dye cloud at each measuring point. (Woodard-USGS)

MAP SHOWING RELATIVE PERMEABILITY OF ROCKS AND SURFICIAL DEPOSITS OF THE ASPEN QUADRANGLE, PITKIN COUNTY, COLORADO, Geological Survey, Washington, D.C.

Available for sale by USGS, Washington, D.C. 20242, Price 30.75. Geological Survey Miscellene-ous Geologic Investigations Maps, Map I-785-F, 1972. I sheet, I map, I ref.

Descriptors: *Geohydrology, *Permeability, *Groundwater movement, *Rock mechanics, *Colorado, Bedrock, Granites, Shales, Geology, Engineering structures, Planning. Identifiers: *Pitkin County (Colo), Aspen quadrangle (Colo).

A map, scale 1:24,000, of Aspen quadrangle, Pit-kin County, Colorado, shows relative permeability of rocks and surficial deposits. Various colors represent areas of high, moderate, and low permeability. Permeability shown on Smuggler Mountain is that of the relatively impermeable grantite bedrock, even though in places a thin permeable soil is developed on the granite. In other parts of the map, soil developed on shale is relatively impermeable, as is the shale itself. Faults and fractures, commonly zones of greater permeability, are not shown. The map is useful for making preliminary judgements for planning construction of highways, canals, tunnels, sewage systems, and building foundations. (Woodard-USGS) W73-06175

SURFACE WATER MAP OF THE SALINA QUADRANGEL, UTAH, Geological Survey, Washington, D.C. H. R. Covington, and P. L. Williams. Available for sale by USGS, Washington, D.C. 20242, Price 30.75. Geological Survey Miscellaneous Geologic Investigations Maps, Map 1-591-F, 1972. 1 sheet, 1 map, 6 ref.

Descriptors: *Streamflow, *Discharge measure-ment, *Gaging stations, *Runoff, *Utah, Maps, Locating, Stream gages, Average flow, Annual, Monthly, Hydrologic data, Histograms. Identifiers: *Saline quadrangle (Utah).

A map of Salina quadrangle, Utah, scale 1:250,000, shows streamflow data for the years 1940 to 1970. Streamflow was measured and recorded by the U.S. Geological Survey at gaging stations located on the map. Average annual streamflow is shown by the size of circles and by acre-feet. Distribution of flow for months of the year is shown by histograms; at most stations, flow is greatest in May and June because of runoff

from melting snow in the high country in the western part of the quadrangle. (Woodard-USGS) W73-06176

MAP SHOWING INFERRED RELATIVE PERMEABILITY OF GEOLOGIC MATERIALS IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO, Geological Survey, Washington, D.C. J.O. Maberry.

J. O. Maberry. Available for sale by USGS, Washington, D.C. 20242, Price \$0.75. Geological Survey Miscellane-ous Geologic Investigations Maps, Map I-770-I,

Descriptors: "Geology, "Permeability, "Geologic units, "Colorado, Mapping, Geological surveys, Engineering geology, Engineering structures, Rock mechanics. Rock mechanics.

Identifiers: *Arapahoe and Douglas Counties (Colo), Inferred relative permeability.

A map (scale 1:24,000) of the Parker quadrangle, Arapahoe and Douglas Counties, Colorado, shows the inferred relative capacity of geologic materials to absorb liquids. Various colors on the map indicate areas of high (most absorptive), intermediate (moderately absorptive), and low (least absorptive) permeability. The reason for assigning absorptive values to the different geologic materials is the need to evaluate the suitability of the materials for local disposal of septic-tank effluent, for construction of lakes and ponds, and for other works of man in which it is important to control liquids at or near the ground surface. (Woodard-USGS) W73-06177

ANALYSIS OF ERRORS IN LOGGING PARAMETERS AND THEIR EFFECTS ON CAL-CULATING WATER SATURATION, Alcore Co., Dallas, Tex. For primary bibliographic entry see Field 08G. W73-06197

FLOW CHARACTERISTICS OF GEORGIA STREAMS, SUMMARIES OF FLOW DURA-TION AND OF LOW AND HIGH FLOWS AT GAGING STATIONS, Geological Survey, Atlanta, Ga.

Geological Survey Open-file Report, 1971. 262 p, 1 fig. 5 ref.

Descriptors: "Streamflow, "Flow characteristics, *Flow duration, "Flow rates, "Georgia, Hydrolog-ic data, Reviews, Basic data collections, High flow, Low-flow frequency, Flow profiles, Stream gages, Gaging stations.

Three computer summaries are presented for extending the utility of basic records of streamflow pertinent to Georgia. These are summaries of flow duration, low flow, and high flow and contain data for 179 streamflow stations having 5 years or more of continuous record as of September 30, 1969. The first part of the duration table for each gaging station shows the distribution of daily discharges during each water wear of moord. station shows the distribution of daily discharges during each water year of record. The second part of the duration table summarizes the data for the period of record in a form suitable for the preparation of a flow-duration curve. In the second part of the duration table, the number of days in each class are totaled, accumulated, and the percentages are computed for the entire period of record shown. The second statistical table for each gaging station shows the lowest mean discharges for 1, 3, 7, 14, 30, 60, 90, 120, 183, and 365 or 366 consecutive days in each 7, 14, 30, 50, 30, 120, 183, and 365 or 366 consecutive days in each year ending March 31. The third statistical table shows the highest mean discharges for 1, 3, 7, 15, 30, 60, 90, 120, 183, and 365 or 366 consecutive days in each water year. (Woodard-USGS)

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DISCRETE TIME STEPS IN DIGITAL COM-PUTER ANALYSIS OF AQUIFERS CONTAIN-ING PUMPED WELLS, Birmingham Univ. (England). Dept. of Civil En-gineering.

For primar W73-06247 ary bibliographic entry see Field 04B.

DIGITAL DATA HANDLING OF SPECTRA UTILIZING FOURIER TRANSFORMATIONS, Alberta Univ., Edmonton. Dept. of Chemistry. G. Horlick. Analytical Chemistry, Vol. 44, No. 6, p 943-947, May 1972. 5 fig, 20 ref.

Descriptors: *Digital computers, *Data storage and retrieval, *Automatic control, Pollutant identification, Computers, Spectroscopy, Instru-

mentation.

Identifiers: *Fourier transformations, *Spectral data, Data interpretation, Differentiation, Resolution enhancement, Signal-noise ratios.

and enhancement, Signal-noise ratios.

Automatic data handling of spectral information in digital form is described using Fourier transformations. Several data handling operations are performed, including smoothing, differentiation, and resolution enhancement. These operations are carried out by appropriate simple modifications of the spacial frequency spectrum is calculated by taking the Fourier transformation of the original spectrum. This calculation and the distribution of information in the spacial frequency spectrum are discussed and illustrated. The implementation of the above operations (smoothing, differentiation, and resolution enhancement) by utilization of the spacial frequency information is described. In particular, this approach to spectral smoothing provides an effective way of maximizing the signal-to-noise ratio of a measurement. (Byrd-Battelle)

WATER RESOURCE PLANNING IN SOUTH WATER RESOURCE PLANNING IN SOIL EAST ENGLAND, Essex River Authority (England). For primary bibliographic entry see Field 06D. W73-06352

COMPUTERIZED PLANNING OF THE LEAST COST WATER DISTRIBUTION NETWORK, Water Planning for Israel Ltd., Tel-Aviv. For primary bibliographic entry see Field 04A. W73-06354

APPENDICES TO A DESCRIPTION OF THE EPRF HYDRODYNAMICAL-NUMERICAL EPRF MODEL.

Naval Postgraduate School, Monterey, Calif. For primary bibliographic entry see Field 02L. W73-06356

BOMEX: AN APPRAISAL OF RESULTS, Washington Univ., Seattle. Dept. of Atmospheric R. G. Fleagle. Science, Vol 176, No 4039, p 1079-1084, June 9, 1972. 5 fig, 24 ref. NSF Grant GA 4091.

Descriptors: *Oceanography, *Meteorology, *At-lantic Ocean, *Tropical regions, *Data collections, Scientific personnel, Governments, Industries, Universities, Investigations, Reviews, Evaluation, Aircraft, Ships, Remote sensing. Identifiers: *BOMEX.

During the months of May, June, and July 1969 the observational phase of the Barbadoo Oceanographic and Meteorological Experiment (BOMEX) was carried out in the region of the tropical Atlantic to the east of the island of Barbados. The observations provided data for 100 investigations on a

wide range of meteorological and oceanographic problems. Results of the investigations are adequate to permit certain generalizations which should be valuable in planning for subsequent large field programs. Vertical fluxes of water vapor, heat, and momentum can be determined with useful accuracy within the surface layer by several methods either from fixed platforms or from aircraft or both. New insights into the structure of the planetary boundary layer over the tropical ocean have been developed. The experience gained in planning and executing the field program and in processing and analyzing data demonstrates that a large, complex field program can be successfully carried out by the coordinated efforts of government, industry, and university scientists, administrators, and technicians. (See also W73-05337 and W73-05338) (Woodard-USGS)

WATER-RESOURCES INVENTORY, SPRING 1966 TO SPRING 1971, ANTELOPE VALLEY-EAST KERN WATER AGENCY AREA, CALIFORNIA,

CALIFORNIA, Geological Survey, Menlo Park, Calif. T. S. Chandler. Geological Survey open-file report, November 29, 1972. 14 p, 6 fig. 5 tab. 4 ref.

Descriptors: *Water resources, *Hydrologic data, *Basic data collections, *California, Surface waters, Groundwater, Water quality, Precipitation (Atmospheric), Evaporation, Streamflow, Aquifers, Water wells, Water levels, Chemical analysis, Water yield. Identifiers: *Antelope Valley-East Kern Water Agency area (Calif), *Water resources inventory.

Precipitation, evaporation, streamflow, and groundwater level data analyzed from spring 1966 to spring 1971 by the U. S. Ge. ogical Survey in the Antelope Valley-East Kern Water Agency area, California, are presented. Monthly precipitation totals from 13 stations are tabulated by both calendar and water years. Evaporation data were tion totals from 13 stations are tabulated by both calendar and water years. Evaporation data were obtained from four evaporation stations, near Fairmont, Mojave, Palmdale, and the Pine Canyon Patrol Station. Streamflow data were collected from nine gaging stations. Water-level contour maps and hydrographs represent data from approximately 130 observation wells. Precipitation and evaporation were about normal, and streamflow was slightly below normal for the 1970 water year. (Woodard-USGS)
W73-06390

NATURAL RESOURCE INFORMATION SYSTEM, DESIGN ANALYSIS.
Boeing Computer Services, Inc, Seattle, Wash.

Available from NTIS, Springfield, Va., 22151, PB-211 383, Price \$3.00 printed copy; \$0.95 microfiche. Contract Report, May, 1972. 27 p, 3 fig, 1 tab, 11 ref, append. Contract No K51C142 00459.

Descriptors: "Natural resources, "Land development, "Data processing, "Land use, "Computer programs, Mapping, Systems analysis, Programming languages, Methodology, Forests, Watersheds (Basins), Ranger, Dry farming, Pastures, Livestock, Mineralogy, Wildlife, Recreation.

A Natural Resources Information System was designed and developed for the Bureau of Indian Affairs and Bureau of Land Management. The computer-based system stores, processes, and dis-plays map data relating to natural resources. Details of the system are described. Fortran IV Details of the system are described. Fortran IV was selected as the programming language. The principal reason for selection was compatibility with BIA and BLM systems. Choice of a digitizer was made between a Gerber 2000 optical line follower and hand digitizers normally used for inputting strip chart recorder data. The gerber was selected on the basis of accuracy and speed. Choice of computers was made between a CDC 6600 and an IBM 360/75. The CDC 6600 was selected primarily on the basis of better access within BCS. Finally, choice of a plotter was made between a CalComp 763 drum plotter and the Gerber 2000. The CalComp was selected because of its higher speed and lower cost. (Woodard-USGS) W73-06393

CALCULATION OF IONIC ACTIVITIES IN CALCULATION OF IONIC ACTIVITIES IN NATURAL WATERS, Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology. For primary bibliographic entry see Field 02K. W73-06403

REPLY, (TO COMMENTS ON ANALYSIS OF STOCHASTIC HYDROLOGIC SYSTEMS), Illinois Univ., Urbana. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A. W73-06406

STOCHASTIC HYDRAULICS-A CHALLENG-ING FIELD OF STUDY, Illinois Univ., Urbanna. Dept. of Civil Engineering. For primary bibliographic entry see Field 02A.

APPLICATION OF DISCRIMINANT ANALYSIS IN DESIGN REVIEW, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research For primary bibliographic entry see Field 06A. W73-06440

08. ENGINEERING WORKS

8A. Structures

DESIGN CRITERIA FOR SUBMARINE PIPELINE CROSSINGS, Ottawa Univ. (Ontario). D. R. Townsend, and D. W. Farley. D. R. Townsena, and D. W. Partey. Meeting Preprint No 1918, American Society of Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 30 p., 12 fig., 16 ref.

Descriptors: *Pipelines, *Underground structures, *Streambeds, *Canada, *Erosion, Pipe founda-tions, Design criteria, Piping systems (Mechani-cal), Conveyance structures. Identifiers: *Submarine pipelines, *Underwater pipelines.

Construction of pipelines through northern stream beds poses special problems due to the high rate of natural erosion of the alluvial streambeds. Spring snow melting produces rapid flood discharges which causes extensive streambed scouring and bank failures. Streambed scouring becomes worse in the vicinity of a pipeline after the top of the pipeline is exposed. The lift and drag forces on the pipe, together with the increased scouring action, will inevitably lead to washout of the pipe. Also, the pipe walls will be subjected to dangerous beading stresses. Pipeline sizes are ever-increasing with plans for 48-inch pipes in Northern Canada and 96-inch pipes in Russia. Use of these larger pipes will require more excess weight to keep it submerged. This excess weight is usually applied by the addition of concrete both-on blocks or saddle weights. Sometimes the entire portion of the pipe which transverses the stream is encased with concrete. Theoretical equations of scouring are used to estimate the critical value of dimensionless shear

Field 08-ENGINEERING WORKS

Group 8A-Structures

stress at which scouring is not significant. Labora-tory tests were conducted to develop methods of preventing pipes from washing out. Rock riprop, packed tightly about the pipe would be effective. The size of the riprap depends on both the Froude Number and the dimensionless shear stress. (Poertner) W73-05940

KEBAN DAM AND HYDROELECTRIC PRO-

JECT, Ebasco Services Inc., New York. J. I. F. Zuazo.

J. I. F. Zuazo.
Meeting Preprint No 1900, American Society of
Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 15 p, 6 fig.

Descriptors: *Dams, *Rockfill dams, *Dam construction, *Hydroelectric power, *Irrigation, Agriculture, Damsites, Dam design, Hydroelectric plants, Instrumentation.

Agriculture, Damsites, Dam design, Hydroelectric plants, Instrumentation.

The Lower Firat Development Project on the historic Euphrates River in Central Anatolia, Turkey will add to Turkey's electric power generation and agricultural production. Total development will result in a generating capacity of 24,000 million KWH and five million acres of land will be irrigated. This will result in a thirty-fold increase in Turkey's agricultural production. The first step in this plan is the Keban Dam. Above the Keban Dam, the Euphrates drains about 66,160 square miles; and, with an average flow of 640 cu m/sec, flow variations from 167 cu m/sec to 6,593 cu m/sec have been recorded. The dam is made up of two types of construction, a concrete gravity section containing the intake and spillway structure and a zoned rock-fill dam has a maximum height of 212 meters, or almost 700 feet, making it one of the ten tallest rock-fill dam has a maximum height of 212 meters, or almost 700 feet, making it one of the ten tallest rock-fill dams in the world. The rock-fill dam extends from a natural rock abutment in the right bank for a distance of 608 meters where it joins the concrete dam, which is 547 meters long at the crest. Total material used for the rock dam included over 15 million cubic meters of rock, clay and filter material. Strict quality control measures were followed, especially in placing the clay layer; for this, a field laboratory was found essential. Besides control during construction, adequate instrumentation was provided to monitor the dam during use. This will produce information helpful in future rock-fill dam design. Rock-fill dams up to 1500 feet are feasible under proper topographical and geological conditions. (Poertner)

STRUCTURES FOR UNDERSEA EXPLORA-

TION,
Lev Zetlin Associates, Inc., New York.
L. Zetlin, I. P. Lew, and A. M. Tomasetti.
Meeting Preprint No 1914, American Society of
Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29February 2, 1973. 22 p, 16, fig, 10 ref.

Descriptors: *Oceans, *Eagineering structures, *Mining, *Investigations, Offshore platforms, Ocean waves, Storage tanks, Oil. Identifiers: Undersea structures.

In our search for resources of various types, the seas and the ocean bottoms have become of greater importance. Present resources derived from the sea include oil, magnesium and bromine. Other resources are plentiful, but not ...noomically obtainable at the present time. Future technology will make it feasible to obtain these resources at an economical solicitic band. The tecanougy win make it reastore to ocean these resources at an economical realistic level. The basic change which will occur is the change from using surface operations to using subsurface operations. Surface operations are affected by storms and wave action, while the environment

below the surface is unaffected by activities at the surface except when you are near the surface. Using light-weight membrane structures, for example, oil can be stored in the ocean in water depths sufficient to allow supertankers to take on the oil without pumping the oil from shore. Other light weight, high-collapse-stress materials can be used to build structures and equipment for use on the ocean bottom. Further development of the resources of the sea will include using the energy of the waves to produce mechanical as well as electrical energy, opening up new possibilities for industries associated with the oceans as well as desalting operations. Also included will be the possibility of housing undersen farming units to provide for the growing food requirements of the world. (Poertner)

UPSTREAM DRAINAGE INCREASES SPILL-WAY STABILITY, Army Engineer District, Kansas City, Mo. C. D. Craddock.

C. D. Cradooce.

Meeting Preprint No 1902, American Society of Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 26 p, 15 fig.

Descriptors: *Dams, *Structural stability, *Slope stabilization, *Subsurface drainage, *Dam failure, *Dam design, Controlled drainage, Earth dams, Flood control, Irrigation, Nebraska, Drainage effects, Drains, Landslides, Soil stabilization, Saturated soils, Soil moisture,

Many dams in the United States were built before the sciences of geological investigation and soil mechanics were well developed. Consequently, some of these dams are not as stable as once thought. In 1965, the Corps of Engineers began a program of reevaluating its dams, modifying them where necessary. This is a case study of the inspection, evaluation and corrective measures taken for the Harlan County Dam, Nebraska. Although no signs of distress were visible, stability of the dam at full reservoir level was found to be marginal. Stability was increased by drilling 3-inch diameter drainage holes into the drainage gallery of the dam. The holes are horizontal, extend 200 feet upstream of the spillway and are placed 10 feet apart. Harlan County Dam is located in South Central Nebraska on the Republican River. The primary purpose of the dam is for flood control and irrigation, with side benefits of recreation. A full reservoir has a surface area of 22,800 acres and extends 17 miles upstream. The dam is a rolled earthfill embankment approximately 12,000 feet long, extending 107 feet above the streambed. Alternative methods of improving the stability of the dam were analyzed, especially the use of foundation anchors. But the use of drain holes was selected due to the low cost, \$30,000 compared to \$370,000 for the anchor plan. (Poertner)

ENVIRONMENTAL PROTECTION MEASURES AT MARTIS CREEK, CALIFORNIA, Army Engineer District, Sacramento, Calif. J. C. Sciandrone.

Meeting Preprint No 1885, American Society of Civil Engineers National Water Resources En-gineering Meeting, Washington, D.C., January 29-February 2, 1973. 13 p, 2 fig.

Descriptors: *Environmental control, *Erosion control, *Turbidity, Dams, Construction, Environment, Erosion, California, Water pollution, Water pollution control. Identifiers: *Martis Creek Lake (California).

The construction of an earth dam on Martis Creek in California needed special attention focused on control of erosion and turbidity due to the popular trout fishing available. Even with control, how-

ever, accidents resulted in periods of excessive stream turbidity. Control measures consisted of: (1) constructing dikes and settling ponds, (2) providing benches and disches in unprotected steep fill slopes, (3) extension of line disches, (4) hydromulching and (5) flocculation. The dam, part of a flood control project completed in 1972, is 113 feet high and 2,670 feet long, having a earthfill structure with a ungated concrete chute. Gross capicity is 20,400 acre-feet with a unface area of about 770 acres. One problem encountered was caused by clogging of the outlet conduit, the stream backed up and overtopped the dam, causing turbidity to rise above the maximum set by law. Removal of debris and construction of alog boom prevented further incidents. Another incident was caused by a storm, which washed construction material into the creek from a borrow area. Dikes were later installed to prevent further episodes. Other techniques were used to control other incidances of erosion and turbidity problems. Such control is within the feasibility of all future contracts where erosion and turbidity are problems. (Poertner)

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SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS, Colorado State Univ., Fort Collins, Dept. of Civil

Engineering.
For primary bibliographic entry see Field 08B.
W73-05949

SEWER TAPPING METHODS, Ecodyne Corp., Lenexa, Kans. Smith and Love-less Div. F. Irwin.

Water and Sewage Works, Vol 119, No 9, p 108-111, September, 1972. 5 fig.

Descriptors: *Sewers, *Sewage, Environmental sanitation, Epoxy resins, Cost analysis, Engineering structures, Infiltration. Identifiers: *Sewer taps, *Sewer lines, *Root intrusion, Groundwater infiltration.

Some of the difficulties encountered in tapping into a sewer main are: (1) cutting time is consuming, (2) hand-cutting results in an uneven hole or cracked pipe, (3) the sewer main is weakened, (4) pipe or joint material usually protrudes into the sewer, (5) concrete will not adhere well to clay or old concrete, and (6) connections are not watertight or root-tight. However, a new method using a specially designed drill and a formed adapter which is sealed with epoxy adhesive will not create the problems encountered with other methods. (Smith-Texas) the problems (Smith-Texas) W73-06048

SAFETY OF DAMS. For primary bibliographic entry see Field 06E. W73-06113

WATER WELL CONSTRUCTION TECHNOLO-GY, PART 1 - AN INTRODUCTION, National Water Well Association, Columbus,

National Ohio.
M. D. Campbell.
Water Well Journal, Vol 26, No 3, p 42-45, March 1972. 9 ref.

Descriptors: Groundwater, *Water wells, Wells, Oil industry, Mineral industry, *Prilling, Drilling equipment, *Technology, Drilling fluids, Pollution abatement, Groundwater resources, Economics, Corrosion, *Reviews.
Identifiers: State-of-the-art report, Well rehabilitation, Well maintenance, Literature searches.

The first of a series of articles covering informa-tion contained in a report by the NWWA Research Facility on well construction technology is given.

Well construction methods presently in operation in the groundwater, petroleum, and mining industries are reviewed. Petroleum and mining industries have been relatively effective in using the latest in drilling technology to reach their goals, and many of these techniques have been simplified, modified, and used by the ground water industry. A large number of factors influence the drilling of any hole. Factors such as rock characteristics, bit selection, and drilling fluid system are discussed as being important in determining penetration rate. (Smith-NWWA) W73-06192

STEREOSCOPIC DEEP WELL PHOTOGRAPHY IN OPAQUE FLUIDS, Laval Underground Surveys, Fresno, Calif. For primary bibliographic entry see Field 08G. W73-06202

GEOMORPHIC-ENGINEERING TERISTICS AND REGIONALIZATION OF MAIN RIVER VALLEYS OF SIBERIA IN CON-NECTION WITH HYDROELECTRIC POWER DEVELOPMENT (OPYT INZHENERNO-GEOMORFOLOGICHESKOV KHARAK--GEOMORFOLOGICHESKOV KHARAK-TERISTIKI I RAYONIROVANIYA DOLIN GLAVNYKH REK SIBIRI V SVYAZI S GIDROENERGETICHESKIM STROITEL 'ST-

VOM), Akademiya Nauk SSSR, Moscow. Institut

Akademya
Geografii
S. S. Korzhuyev, and A. A. Fedotov.
Geomorfologiya, No 1, p 48-61, January-March
1972. 4 fig, 1 tab, 17 ref.

Descriptors: *Engineering geology, *Geomorphology, *Valleys, *Rivers, *Hydroelectric power, Hydroelectric plants, Reservoirs, Dams, Damsites, Dam construction, Foundation investigations, Foundation rocks, Structural geology, Seismology, Sedimentology, Hydrogeology, Permafrost, Terrain analysis, Surveys, Projects.
Identifiers: *USSR, *Siberia, Tectonics, Regionalization.

ageomorphic regionalization of the main river valleys of Siberia is proposed for selecting potential sites for hydroelectric power stations. The major regional units examined are the valleys of the Ob', Irtysh, Yenisey, and Lena Rivers together with their principal tributaries—the Bisy, Katun', Tom', Chulym, Angara, Stony Tunguska, Lower Tunguska, Kureyka, Vilyuy, Aldan, Olekma, and Amga—as well as the valleys of the Olekand Pyasina Rivers. The regionalization is based on geomorphic features that relate to the stability of dams and to construction conditions: valley morphology; composition and thickness of sediments; geological structure and properties of foundation rocks; permafrost and slope processes; seismic activity; local availability of building materials; and presence of mineral deposits and other valuable lands in areas to be flooded by reservoirs. Based on these criteria, six major regions are distinguished: (1) the mountains, including the west slopes of the Altay and Sayan Lylands; (2) the plains, covering the West Siberian lowland; (4) the trap plateau, occupying the west and central portions of the Siberian platform; (5) the bedded plateau, occupying the south and northeast portions of the Siberian platform; and (6) the tableland, covering the central portions of the Aldan shield and Anabar massif. Potential damsites are listed for each major region together with projects that have been completed or are in progress. (Josefson-USGS)

APPLICATION OF DISCRIMINANT ANALYSIS IN DESIGN REVIEW, Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research ary bibliographic entry see Field 06A.

SEWERAGE MANUAL, A GUIDE FOR THE PREPARATION OF APPLICATIONS, REPORTS AND PANS.
Pennsylvania Dept. of Environmental Resources,
Harrisburg. Bureau of Water Quality Manage-For primary bibliographic entry see Field 05D.

CITY OF TORONTO SEWER SYSTEM, Toronto Dept. of Public Works (Ontario). R. M. Bremner. Progress Report No 1, January 13, 1970. 33 p, 12 fig, 9 tab.

Descriptors: *Sewerage, *Sanitary engineering, *Reviews, *Water pollution control, *Flood control, Sewers, Storm drains, Utilities, Evaluation, Canada, Public utilities, Programs, Maintenance costs, Maintenance, Construction. Identifiers: *Toronto (Ontario), *Sewer maintenance, *Sewer construction.

tenance, *Sewer construction.

With the adoption of a program for sewers in the City of Toronto in 1965, review of program progress every 5 years was required. This report is the first review of that program and describes progress made since 1965 in fulfilling there objectives, namely: (1) the elimination of flooding (from storms) of private property, (2) the elimination and all flooding in Toronto, and (3) the reduction and eventual elimination of pollutional discharges to the Waterfront, Humber River and the Don River. By the end of 1970, 832 million had been spent on new sewers, providing for flood relief in many areas. Beside new sewer construction, which is planned for at \$25 million for the next 5 years and 374 million for the next 20 years, there is a main-tenance program for existing sewers to provide for sewer repair, sewer cleaning, and control of pollution in combined sewers. Annual costs are estimated at \$431,000 per year from 1970 to 1974. Recommendations include continuation of the sewer construction and maintenance programs, review of sewer progress in 1975, and the support of proposed federal legislation, the Canada Water Act, to provide for a regional approach to water resources. The latter would provide for the establishment of water quality agencies by pooling federal and provincial resources. Funding is not proposed under the Canada Water Act, but funding may become available under another federal program, the National Housing Act. (Poertaer)

FEASIBILITY OF UTILITY TUNNELS IN URBAN AREAS, Chicago Dept. of Water and Sewers, Ill. J. B. W. Corey.
Paper presented at the American Water Works Association Annual Meeting, Denver, Colorado, June 14, 1971, 12 p, 5 fig.

Descriptors: "Utilities, "Tunnel design, "Public utilities, "Tunnels, "Reviews, Feasibility studies, Underground structures, Conveyance structures, Water distribution (Applied), Electrical networks, Sewers, Distribution systems, Pipelines, Tunneling, Multiple-purpose projects.
Identifiers: "Utility tunnels, "Utility distribution

The results of an 18-month study of the feasibility of utility tunnes was published by the American Public Works Association Research Foundation in its Special Report No. 39. That report is the basis

of this paper. The concept of underground utility tunnels has received increasing attention due to a number of reasons including aesthetics, the cost of urban rights-of-way, environmental impacts, service expansion and maintenance. The concept of utility tunnels is not new, for such facilities exist in Europe, Axia, and North America. Although there are few municipal systems in Europe. Along with the advantages of of utility tunnels there are some noteworthy disadvantages. In a developed city, movement of present utilities to a tunnel would be costly and disruptive. Maintenance of the utilities in the tunnel would require that all personnel understand the hazards of all contained utilities. There could exist interference between different utilities. Gas explosions constitute a utilities. There could exist interference between different utilities. Gas explosions constitute a potential hazard. Security of the tunnel from sabotage or vandalism would be necessary. Tunnel layout would need to be arranged to benefit all contained utilities and ownership of the tunnel needs to be solved. It was concluded that utility tunnel feasibility can be determined only by examination of prevailing circumstances and conditions of specific projects. (Poertner)

FLOOD PROOFING PUBLIC FACILITIES. Cincinnati Engineering Div., Ohio. For primary bibliographic entry see Field 04A. W73-06467

AN ANALYSIS OF PITTSBURGH STORM INLET CAPACITIES AND SPACING REQUIRE-MENTS, Pittsburgh Urban Redevelopment Authority, Pa. R. Mickelsen, and J. A. Wojno. April 1971. 37 p, 22 fig. 7 ref.

Descriptors: "Storm drains, "Storm runoff, "Drainage engineering, "Drainage practices, Drainage systems, Sewers, Systems analysis, Engineering structures, Design criteria, Design standards, Road design, Surface runoff, Runoff. Identifiers: "Street drains, "Storm drain inlets, Inlet spacing.

Instead of relying on a rule of thumb, the City of Pittsburgh made a study to determine realistic spacing requirements for storm drain inlets in streets. Three factors were considered, namely: (1) gutter capacity, (2) storm drain inlet capacity and, (3) storm runoff. Starting with Larson's Equation, gutter flow is determined to be (after setting Manning's roughness coefficient to 0.02 and the inverse of the cross-slope to 1/4 inch per foot) Q±1344 s1/2 y8/3, and v±561/2 y2/3; where is the slope, y is the water level against the curb, v is the velocity, and Q is the volume flow rate. The other factors involved in inlet size and spacing design are similarly computed and a nomograph is derived together with graphs of the capacities of the gutter, curb, inlet and street-inlet for various street grades. (Poertner)

8B. Hydraulics

THEORY OF AQUIFER TESTS, Geological Survey, Washington, D.C. Por primary bibliographic entry see Field 02F. W73-03909

A THERMAL FLOWMETER FOR MEASURING VELOCITY OF FLOW IN A WELL, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 67B. W73-05916

Group 8B-Hydraulics

CONSTANT-HEAD PUMPING TEST OF A MUL-CONSTANT-HEAD FUMPING TEST OF A MULTIAQUIFER WELL TO DETERMINE CHARAC-TERISTICS OF INDIVIDUAL AQUIFERS, Geological Survey, Washington, D.C. G. D. Bennett, and E. P. Patten, Jr. Water Supply Paper 1536-G, 1962. 22 p, 6 fig, 1 tab. 5 ref.

Descriptors: Wells, *Water wells, Specific capaci-ty, Drawdown, Aquifer characteristics, *Pump testing, Boreholes, Storage coefficient, Transmis-sivity, Well data, Test wells, Equilibrium, Discharge (Water), On-site tests. Identifiers: *Multiaquifer wells, Hydrostatic head.

Identifiers: "Multinquifer wells, Hydrostatic head. Theory and field procedures for determining the transmissibility and storage coefficients and the original hydrostatic head of each aquifer penetrated by a multiaquifer well are described. The procedure involves pumping the well in such a manner that the drawdown of water level is constant while the discharges of the different aquifers are measured by means of borehole flowmeters. The internal discharge between aquifers after the well is completed is analyzed as the first step. Pumping at constant drawdown constitutes the second step. Transmissibility and storage coefficients are determined by a method described by Jacob and Lohman, after the original internal discharge to or from the aquifer has been compensated for in the calculations. The original hydrostatic head of each aquifer is then determined by resubstituting the transmissibility and storage coefficients into the first step of the analysis. The method was tested on a well in Chester County, Pa., but the results were not entirely satisfactory, method was ussed on a well in Clester County, Pa, but the results were not entirely satisfactory, owing to the lack of sufficiently accurate methods of flow measurement and, probably, to the effects of entrance losses in the well. It is felt that better results may be achieved in the future, as more reliable devices for metering the flow become available and as more is learned concerning the nature of entrance losses. (Campbell-NWWA) W73-05912

DEEP STRATIGRAPHIC TEST WELL NEAR ROCK ISLAND, ILLINOIS, Illinois State Geological Survey, Urbana. T. C. Buschbach.

Circular 394, 1965. 20 p, 4 fig, 1 tab, 18 ref.

Descriptors: "Wells, "Deep wells, Natural gas, "Il-linois, "Logging (Recording), Electrical well logging, Radioactive well logging, "Test wells, Stratigraphy, "Underground storage. Identifiers: "Storage wells, Precambrian base-

Exploration for underground gas storage reservoirs resulted in the drilling of a deep stratigraphic test well about 10 miles south of Rock Island, Illinois. Radioactivity, electrical, and sonic logs, with a description of cores and samples from the well, provide information not available previously about the sequence of deeper strata in the region. Precambrian rocks were encountered at a depth of Precambrain rocks were encountered as a deput of 3,855 feet. Possible reservoirs for gas storage were found in the St. Peter, Ironton-Galesville, and Mt. Simon Sandstones. As this was the first well drilled to the Precambrian basement in this part of usine to the rrecamorian basement in this part of the state, information about the sequence of deeper strata in the region is provided. Strata en-countered in the well and the geologic system revealed by it are described. (Smith-NWWA) W73-05913

THE ACCURACY OF THE SOLUTIONS OF UNSTEADY FLOW TOWARD A WELL, Hydronautics, Inc., Laurel, Md.

G. Dagan. In: Proceedings of the National Symposium on Groundwater Hydrology, p 169-175, November 1967. 2 fig, 7 ref. Descriptors: Groundwater, Groundwater move-ment, Wells, Water wells, Well data, "Hydraulic models, "Aquifer testing, Drawdown, Equations, "Unsteady flow, Theis equation, Laplaces equa-

Identifiers: *Flow equations, Fully penetrating wells, Partial penetration, Point sinks.

wells, Partial penetration, Point sinks.

The existing solutions of unsteady free-surface flow toward a well are based on several simplifying assumptions. The physical assumptions of aquifer homogeneity, constant drainable porosity and constant pressure on the free-surface are used in the derivation of the differential equations of flow. Other assumptions, of mathematical nature, are introduced in order to solve the differential equations. The validity of the mathematical assumptions is discussed. Although a second order approximation for the drawdown caused by a partially penetrating well in an aquifer of finite thickness has not yet been derived, the two cases discussed permit the conclusion that for drawdown of less than a few percent of the aquifer thickness (in the case of partially penetrating wells) and 10 percent of the aquifer thickness (in the case of fully penetrating wells) the accuracy of the usual first order linearized solutions is ensured. (Campbell-NWWA)

W73-05918

RESEARCH TRENDS IN GROUNDWATER MOVEMENT AND WELL HYDRAULICS, New Mexico Inst. of Mining and Technology Socorro. Dept. of Ground-Water Hydrology.

Socorro. De C. E. Jacob.

C. E. Jacob. In: Proceedings of the National Symposium on Ground-Water Hydrology, p 135-137, November

Descriptors: "Groundwater, Hydraulics, Leaching, Mineral industry, Mining, Wells, Viscousity, Wiscous flow, Elastic theory, Ellasticity (Mechanical), Transmissivity, Theis equation, Strain measurement, Computers, *Research and development, Research priorities, Identifiers: "Well hydraulics, Hydraulic doublets.

Kinds of research which are presently being carried out include phenomena which take place during underground explosions, the generalized theory of flow of viscous fluids in compressible elastic media, including taking into account 'dilatational viscosity,' and the leaching of ores in place. It has been found that strain-gradients have a very strong influence upon the strengths of elastic materials. Diffusive and dispersive flows which might have bearing on mining by means of wells are being studied. Hydraulic doublets, which are pairs of positive and negative hydraulic poles which balance each other, are being actively researched. It is thought that the interface between fluids can be stabilized by means of a fractionally penetrating doublet. (Smith-NWWA)

SALT WATER INTRUSION IN COASTAL WELL FIELDS, North Carolina State Univ., Raleigh. For primary bibliographic entry see Field 02L. W73-05923

ASSOCIATION OF SALINITY VARIATIONS AND GEOPRESSURES IN SOFT AND HARD ROCK, Continental Oil Co., Ponca City, Okla. W. Ferth, and D. Timko. In: Society of Professional Well Log Analysts 11th Annual Logging Symposium, p J1-J24, May 3-6, 1970. 12 fig, 2 tab, 39 ref.

Descriptors: "Salinity, "Logging (Recording, Resistivity, Wells, Electrical well logging, Borehoves, Stability, Brines, Chlorides, Geologic control, ladicators, Groundwater, "Formation evaluation, "Oklahoma.

Identifiers: *Geopressures, Tectonics.

In situ and surface measurements of salinity variations in formations penetrated by the drill bit can be conducted. Experience in soft and hard rock country indicates that changes in salinity are related to environmental conditions and tectonic features. Of importance is the evidence that such salinity variations appear to be related to the occurrence of overpressured formations (geopressures). However, such correlation may be limited by the fact that formation salinities can vary quite markedly with rock stresses due to tectonics such as faulting, salt dome upilit, suconformities, and other local or regional geology. In addition, salinity variations combined with other conventional logging parameters help to pin-point formations which exhibit severe borehole stability problems. Field case examples from the Gulf Coast area and Oklahoma are presented which illustrate the application of the salinity concept to several engineering and geologic problems. (Campbell-NWWA) W73-05929

GROUNDWATER RECOVERY, Techniache Hogeschool, Delft (Netherlands). For primary bibliographic entry see Field 04B. W73-05933

SEDIMENT ROUTING IN IRRIGATION CANAL SYSTEMS, Colorado State Univ., Fort Collins, Dept. of Civil

Engineering.
K. Mahmood.
Meeting D M. Manmood.

Meeting Preprint No 1905, American Society of Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 30 p, 8 fig. 2 tabs, 11 ref.

Descriptors: "Irrigation canals, "Sediment, "Water conveyance, "Sediment distribution, Tur-nouts, Model studies, Sediment load, Bed load, Ir-rigation systems, Irrigation ditches.

rigation systems, Irrigation ditches.

The maintenance of irrigation channels requires control of sedimentation. One method of control is to insure that sediment is transparted with the water as much as possible. In such a system, the most critical component is the transport of sediment in the farm watercourse channels. These channels, with low water velocities have poor bedmaterial carrying capacity and are further hurt by limited maintenance. Design of the turnout to the farms is also important in determining the amount of sediment the water can carry. But disposal of all sediment with the flow is but one method of maintaining the channels and is often not enough. Dredging and other forms of bed clearance may be needed. Additional factors which need to be considered include vegetative growth in the channels and physical condition of the channel. A numerical model is developed for predicting sediment-carrying characteristics of irrigation canals, as well as for farm turnouts. (Poertner)

EMERGENCY REDESIGN OF SILVER JACK SPILLWAY,

SPILLWAY, Bureau of Reclamation, Denver, Colo. Engineer-ing and Research Center. G.W. Center, and M. Rhone. Meeting Preprint No 1899, American Society of Civil Engineers National Water Resources En-gineering Meeting, January 29-February 2, 1973, Washington, D.C. 28 p, 14 fig, 2 ref.

Descriptors: *Dam construction, *Hydraulic models, *Hydraulic structures, *Spillways, *Landslides, Damsites, Construction, Setting basins, Dams, Design, Hydraulics, Model studies, Identifiers: Silver Jack Dam (Colorado).

The construction of Silver Jack Dam, located on Cimarron Creek in Western Colorado, was well

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INTER STRAT State U Enginee R. R. Ri Journal Society 9633, p append

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underway when a major earth movement occurred at the right abutment where the spillway was to be located. The landslide damaged the partially con-structed spillway and forced the contractor to alter his initial plans. Using a scale model, a design was structed spillway and forced the contractor to alter his initial plans. Using a scale model, a design was developed for a new spillway structure. An elbow was constructed for the spillway conduit and major consideration had to be given to the design of a stilling basin due to the unsymmetrical approach of the flow resulting from the circular curve in the upstream conduit. By using various combinations of baffle blocks, a suitable realignment of the spillway was determined in laboratory tests. The new spillway design was used without much delay in construction time. To improve the stability of the landslide material, a plan was developed to provide for drainage and for buttressing the toe of the slide mass by adding gravel and cooble fill material at the base. (Poertner)

CHARACTERISTICS OF HYDROFOIL WEIRS, Indian Inst. of Science, Bangalore. Dept. of Civil and Hydraulic Engineering.

N.S. Lakshmana Rao, and M. V. Jagannadha Rao. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY2, Paper 9542, p 259-283, February 1973. 18 fig, 9 ref, appeared.

Descriptors: "Weirs, "Discharge, Coefficient, "Discharge measurement, "Open channel flow, "Stage-discharge relations, Spillway crests, Hydraulics, Boundary layers. Identifiers: "Weirs (Hydrofoil).

Identifiers: "Weirs (Hydrofoul).

The symmetric Joukowsky profile was investigated for its performance as a weir profile both under free flow and submerged flow conditions. The discharge coefficient is a function of head and of the eccentricity factor, which defines the weir geometry. The discharge coefficient increases with profile thickness and crest curvature. The boundary layer effects on this weir coefficient are very small. The discharge coefficient is about 15% to 20% higher than the conventional rectangular broad-crested weir. Under submerged flow conditions, the thinner hydrofoil weirs possess a higher submergence limit (80% and more), which varies with head. The discharge reduction factor for a given submergence is smaller than that of a crump Weir. The overall performance of hydrofoil weir is superior and is therefore recommended for flow measurement in open channels. (Knapp-USGS) W73-05958

INTERFACIAL WAVE BREAKING IN STRATIFIED LIQUIDS, State Univ. of New York, Buffalo. Dept. of Civil

Engineering. R. R. Rumer, Jr.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9633, p 509-524, March 1973. 11 fig. 1 tab, 20 ref, append. EPA-WQ Grant 16070 DGY.

Descriptors: "Waves (Water), "Stratified flow, "Interfaces, "Seiches, "Internal waves, Saline water-freshwater interfaces, Thermal stratification, Defined stratification, Diffusion, Mixing, Density currents, Turbidity currents.

Interfacial instability is controlled largely by the difference in density and the thickness of the transition region between the two layers. The horizontal velocities of the upper and lower layers associated with an internal seiche in a stratified lake were studied in relation to critical shear gradients necessary for the growth of unstable short period interfacial waves with frequency close to the Brunt-Vaisala frequency. Experimental results obtained from steady nonuniform surface flows over a stagnant denser fluid help to clarify the conditions for the occurrence of the short period waves. (Knapp-USGS)

W71-05960

COMPUTER PROGRAMMING FOR FLOW OVER SIDE WEIRS, Southampton Univ. (England). Dept. of Civil En-

gineering.
K. V. H. Smith.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 99, No HY3, Paper
9626, p 495-508, March 1973. 4 fig. 2 tab, 8 ref, apneed.

Descriptors: *Computer programs, *Open channel flow, *Weirs, *Flow profiks, Discharge (Water), Stage-discharge relations, Numerical analysis, Critical flow, Supercritical flow, Overflow, Spill-

ways. Identifiers: *Side weirs.

A computer program is presented for calculating water surface profiles and discharge in an open channel with flow over side weirs. There is little restriction about the channel shape, variation of invert slope, convergence of the channel along the length of weir, etc. A criterion for determining whether flow will be subcritical or supercritical on a mild slope is also developed. The procedure is illustrated by some examples. (Knapp-USGS) W73-05961

TRANSIENT FLOW TO FINITE WELL IN UN-CONFINED AQUIFER,
California Univ., Los Angeles. School of Engineering and Applied Science.
For primary bibliographic entry see Field 04B.
W73-05962

DIFFERENCE METHOD FOR HIGHER-ORDER

BUFFERNCE METHOD FOR HIGHER-ORDER
EQUATIONS OF FLOW,
International Courses in Hydrology and Sanitary
Engineering, Delft (Netherlands). Computational
Hydrology Group.
G. S. Rodenhuis.

O. D. Acuennuis.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9628, p 471-483, March 1973. 6 fig, 2 tab, 15 ref, append.

Descriptors: *Open channel flow, *Flow characteristics, *Numerical analysis, Transition flow, Waves (Water), Finite element analysis, Equations, Mathematical studies.

A quasi-Lagrangian difference scheme can be used to describe higher-order systems of flow. Constructed on a computational grid formed by the third-order characteristics, it has no amplitude ure unru-order characteristics, it has no amplitude error and offers a possibility to represent tea-dencies towards instability of the flow. A filtering process eliminates the effect of phase-errors. (K-napp-USGS) W73-05963

RIPPLE PROFILES MODELED MATHEMATI-CALLY, Colorado State Univ., Fort Collins. Dept. of Civil

Coloriado State Only, Por Colmis, Dept. of Civil Engineering, A. G. Mercer, and M. I. Haque. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY3, Paper 9618, p 441-459, March 1973. 13 fig, 18 ref, ap-

Descriptors: *Ripple marks, *Dunes, *Channel morphology, *Flow characteristics, Alluvial channels, Bed load, Sediment transport, Turbulence, Vortices, Profiles.

Ripple and dune behavior is fundamentally af-fected by the eddy zone in the lee of the bedform. A profile model based on irrotational flow and in-corporating an eddy zone is an advancement on ainusoidal profile models. Velocity and pressure data taken from a styrofoam replica of the profile

model are compared to those obtained theoreti-cally assuming irrotational flow and also to those obtained theoretically assuming inviscid rotational flow. The inviscid rotational model shows good agreement with the experimental results. A complete model of bedform behavior involves the relationship between the bedform profile, the flow over the bedform, and the sediment transport over the bedform. (Knapp-USGS)

SOME PROBLEMS OF SIMULATION ON ERODBLE MODELS (NEKOTORYYE VOPROSY MODELIROVANIYA NA RAZ-MYVAYEMYKH MODELYAKH), Gosudarstvennyi Gidrologicheski Institut, Leningrad (USSR).

N. S. Znamenskayc, and V. M. Klaven.

In: Gidravlido-morfologicheskiye isaledovaniya rek i vodoyemov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 169, p 181-204, Leningrad, 1969, 5 fig, 2 tab, 10 ref.

Descriptors: "Model studies, "Hydraulic models, "Hydraulic similitude, "Channel erosion, Dunes, Bottom sediments, Sediment discharge, Sediment transport, Flumes, Froude number, Laboratory tests, Equations. Identifiers: "USSR.

Cases where simulation of channel deformation on two- and three-dimensional erodible models is possible are examined, and the conditions which must be observed to ensure similitude between the must be observed to ensure similating between the model and nature are analyzed. Results are re-ported on experimental studies of 25 different simulation conditions for the same prototype on erodible models where the similatingle between the shape of the dune in the model and in nature is preserved. Recommendations are made on the basis of comparisons for conversion of model data to natural conditions. Simulation of dune height should be accomplished by a scale factor related to the type of stream and sedin formation. (Josefson-USGS) W73-05986 diment that cause dune

A STRUCTURAL APPROACH TO CHANNEL MORPHOMETRY (O STRUKTURNOM PODK-HODE K RUSLOVOY MORFOMETRII), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).

In: Gidravliko-morfologicheskiye issledovaniya rek i vodoyemov; Gosudarstvennyy Gidrologicheskiy Institut Trudy, No 169, p 18-33, Leningrad, 1969. 5 fig. 4 tab, 27 ref.

Descriptors: *Channel morphology, *Channels, *Streams, *Beds, Thalweg, Valleys, Slopes, Flood plains, Meanders, Discharge (Water), Sediment transport, Dunes, Particle size, Dimensions, Variability, Equations.

Identifiers: *USSR.

Besides a determination of general channel forms, structural morphometry involves calculation of the dimensions, mobility, and variability of typical elements of channel relief. Three structural elements of the relief are distinguished on the floor of a river valley: (1) the flood plain, consisting of several massifs (macroforms); (2) the channel—the constant of the floor of the constant of the co several massifs (macroforms); (2) the channel—the zone of systematic, active transportation of sediments as dune mesoforms; and (3) the stream—the permanently submerged thalweg of the channel. In conformity with this classification, all morphometric descriptions of channel forms should be divided into morphological and dynamic indices. The basic morphometric relations derived for mesoforms can be used for rough calculations. (Josefson-USGS)
W73-05989

Field 08—ENGINEERING WORKS

Group 8B—Hydraulics

EDDY DIFFUSIVITY AND VELOCITY PROFILES FOR A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN

CHANNEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. B. M. Mehta. M Sc Thesis, October 1971, 92 pc 26 fig, 18 tab, append. OWRR A-019-NJ (3).

Descriptors: "Velocity, "Turbulent flow, Dispersion, "Diffusivity, Temperature, Thermal pollution, Eddies, "Model studies, Path of pollutants, "Open channel flow.

The time-averaged equation of motion, for the case of variable eddy diffusivities, is solved by numerical methods. A solution is applied to uniform, turbulent flow in a smooth, rectangular open-channel. Solutions are used to predict velocity variations on cross-sections normal to the direction of bulk flow. Existing open-channel flow data are used to verify the model. Additional velocity data have been obtained for three widths-to-depths ratios in a laboratory flume. (Ahlert-Rutgers)

VELOCITY PROFILES AND CHARAC-TERISTICS OF A TURBULENT UNIFORM FLOW IN A SMOOTH RECTANGULAR OPEN

CHANNEL, Rutgers - The State Univ., New Brunswick, N.J. Dept. of Chemical Engineering. J. V. Maxham.

M Sc Thesis, May 1971, 95 p, 35 fig, 5 tab, append. OWRR-A-019-NJ (2).

Descriptors: *Velocity, *Turbulent flow, Dispersion, Diffusivity, Temperature, Thermal pollution, Eddies, *Open channel flow.

A laboratory open-channel was built and operated at both sub-critical and super-critical Froude numbers. Eight profiles of velocity were obtained, four each in the two flow regimes. In addition, percent urbulence with respect to local time-average velocity was observed with a hot-film anemometer. An analytic solution to the equation of motion for turbulent flow, with constant-average eddy diffusivities, was found to be a poor predictor of the measured velocity distributions. An empirical logarithmic relation, equivalent to the Law of the Wall developed by Prandtl from mixing length theory, correlated experimental data quite well. The two-region correlation for velocity profile, proposed by Yen, gave relatively good agreement, also. (Ahlert-Rutgers)

ANALYSIS OF THE DISPERSION OF THER-MAL EFFLUENTS, Rutgers - The State Univ., New Brunswick, N.J. Coll. of Engineering. For primary bibliographic entry see Field 05B. W73-06102

TRANSPORTABLE BREAKWATER, C. G. Hard. U.S. Patent No. 3,691,774, 3 p, 4 fig, 3 ref; Official Gazette of the United States Patent Office, Vol. 902, No. 3, p. 857, September 19, 1972.

Descriptors: "Patents, "Breakwaters, Beach ero-sion, Ocean waves, "Shore protection, Coasts, Tidal effects, Beaches, Seashores, "Barriers,

A breakwater consists of a series of floating units, each having a horizontal fin-like protrusion which rotates to a vertical position for intercepting waves when the unit is tipped leeward by wave action. Mooring blocks are arranged in tandem to gradually absorb the total drag of the wave forces. (Sinha-OEIS)
W73.06145

MASS DIFFUSION IN A SELF-CONFINED ROTATING FLOW, Cornell Univ., Ithaca, N.Y.

Cornell Univ., Ithaca, N.Y.
K.E. Torrance.
Available from NTIS, Springfield, Va 22151 as
NASA CR-2172 Price 33.00 printed copy; 50.95 in
microfiche. National Aeronautics and Space Administration Contractor Report NASA CR-2172
November 1972. 11 p, 4 fig, 5 ref. NGL 33-010-042.

Descriptors: "Fluid mechanics, "Diffusion, "Standing waters, "Rotational flow, Numerical analysis, Methodology, Mass transfer, Vortices, Mixing, Design criteria.

Identifiers: Fluid confinement, "Mass diffusion.

Identifiers: Fluid confinement, *Mass diffusion.

Containment of one fluid by a suitably-directed stream (or streams) of another fluid is a problem of considerable practical interest, particularly for the generation of power from chemical and nuclear rules. Several containment schemes have been suggested which focus on the establishment of some sort of closed recirculation zone. Mass exchange by diffusion eventually depletes any fluid initially contained in the zone, however, and replenishment of critical species is required. Diffusional loss from a particular containment zone is examined along with the feasibility of using a small supply stream to replenish critical species to the zone. The effectiveness of fluid containment near an interior stagnation point and within a self-confined stagnation region is determined by numerically solving the species conservation equation for a bi-component mixture. The flow geometry is that of a swirling fluid stream containing a stationary eddy on the axis of rotation. The base flow is axisymmetric and the Reynolds number is equal to 50. Schmidt numbers range from 0.1 to 10. (Woodard-USGS) (Woodard-USGS) W73-06184

A CONSTANT-HEAD FLOATING-SIPHON STAGE-RECORDING SYSTEM, Illinois Univ., Urbana. For primary bibliographic entry see Field 02A. W73-06189

INVESTIGATIONS OF CONFINED AND OPEN TURBULENT FLOWS AT THE INSTITUTE OF FLUID MECHANICS, UKRAINIAN ACADEMY

OF SCIENCES, I. L. Rozovskii. Fluid Mechanics—Soviet Research, Vol 1, No 5, p 176-187, September-October 1972. 5 fig, 19 ref.

Descriptors: *Foreign research, *Fluid mechanics, *Flow, *Turbulence, *Turbulent flow, Turbulent boundary layers, Reynolds number, Viscosity, Velocity, Diffusion, Jets, Open channels, Pipes, Tubes, Suspension, Suspended solids, Photography, Equations.
Identifiers: *USSR, Kinematics.

Studies conducted for a number of years at the Institute of Fluid Mechanics of the Ukrainian Academy of Sciences include investigations of tundence in uniform, nonuniform, and unsteady flows in pressure ducts and open channels; research on structure of turbulent flows with surfaces of separation; and experiments on the kinematic structure and dynamic characteristics of tundents of the control of the control

DIFFUSION AND VORTEX MODELS OF THE TURBULENT JET, A. G. Prudnikov, V. N. Sagalovich, and E. P. Yukina.

Fluid Mechanics-Soviet Research, Vol 1, No 5, p 87-97, September-October 1972. 9 fig, 16 ref.

Descriptors: "Model studies, "Jets, "Turbulence, "Vortices, "Diffusion, Dispersion, Mixing, Flow, Turbulent flow, Turbulent boundary layers, Velocity, Temperature, Equations. Identifiers: "USSR.

The diffusion model of the jet is used in the solution of a number of practical problems. This model merely postulates a simple form of turbulent transfer (turbulent diffusion) and does not include the physical nature of turbulence. A more promising approach to the development of semiempirical theories is the vortex model, based on representation of turbulent flows as a statistical set of vortices. Experimental velocity profiles in the mixing zone and turbulent boundary layer are compared with theoretical curves computed with this model. (Josefson-USGS) W73-06237

TURBULENT CO-FLOWS WITH ZERO EX-CESS MOMENTUM, A. S. Ginevskii, L. N. Ukhanova, and K. A.

Fluid Mechanics-Soviet Research, Vol 1, No 5, p 81-86, September-October 1972. 4 fig, 6 ref.

Descriptors: "Fluid mechanics, "Flow, "Turbulence, "Turbulent flow, "Momentum equation, Velocity, Reynolds number, Viscosity, Shear stress, Hydroelectric plants.

Identifiers: "USSR."

A method for computing the velocity field of near and far regions of axisymmetric turbulent wakes of hydrodrives with zero excess momentum was based on the use of the results of experimental and theoretical studies of micro- and macro-structures of turbulent flow. The computations agree satisfactorily with experimental values of the empirical constants characteristics of ordinary jets and wakes with positive or negative excess momentum. (Josefson-USGS)

CALCULATION OF TURBULENT MIXING OF PARALLEL FLOWS, 1. L. Vulis. Fluid Mechanics—Soviet Research, Vol 1, No 5, p 1-5, September-October 1972. 2 fig, 4 ref.

Descriptors: "Fluid mechanics, "Flow, "Turbu-lence, "Mixing, Thermal conductivity, Heat flow, Temperature, Velocity, Stress, Gases, Boundary processes, Boundary layers, Jets, Equations. Identifiers: "USSR.

The equivalent-problem method used in the theory of heat conductivity was applied to solution of the self-modeling problem of turbulent mixing at the boundary between two homogeneous flows. For self-modeling flows the calculation, using the equivalent-problem method, requires adoption of one of the empirical constants from the experiment together with calculation based on one of the well-known Prandtl formulas for shear-stress friction. Solution of this problem as well as solution of other problems that arise in the theory of free turbulent jets can be used in calculations of certain air and ocean currents. (Josefson-USGS) W73-06239

MEASUREMENTS ON HORIZONTAL BUOYANT JET IN CALM AMBIENT FLUID, WITH THEORY BASED ON VARIABLE COEFFICIENT OF ENTRAINMENT DETERMINED EXPERIMENTALLY, Hydraulics Research Station, Wallingford, (England).
H. O. Anwar.
La Houille Blanche, No 4, p 311-319, 1972. 14 fig, 2 tab, 11 ref.

Descriptors: *Mathematical models, *Jets, *Density, Fluid mechanics, Hydrodynamics, Velocity,

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Water circulation, Convection, Nozzles, Outlets, Buoyancy, Thermal pollution, Currents, Photometry, Analytical techniques, Froude number, Batrainment, Path of pollutants. Identifiers: Forced plumes.

A study was performed to confirm the theoretical behavior of a forced plume (buoyant jet) discharged from a horizontal nozzle into stagmant fluid. Warm water at about 58 C was discharged from a horizontal nozzle of 1/2 in. diameter into from a horizontal nozzle of 1/2 in. diameter into ambient fresh water at a temperature of about 11 C. Temperature, temperature fluctuations, velocity and trajectory of the plumes were measured at various densimeteric Froude numbers based on nozzle diameter, ranging from 5 to 16. Although experimental results did not agree with results from a theoretical approach based upon the theory of convectional plumes when the Froude number was larger than 10, a better agreement was obtained from the modified theory based on constant coefficient of entrainment. (Jerome-Vanderbilt) W73-06369

TEMPERATURE FLUCTUATIONS AT AN AIR-WATER INTERFACE CAUSED BY SURFACE

Argonne National Lab., Ill. For primary bibliographic entry see Field 02E. W73-06378

THERMAL INSTABILITIES IN TWO-FLUID THERMAL INSTABILITIES IN THE PROPERTY OF THE P

Descriptors: *Fluid mechanics, *Stratification, *Thermal properties, Thermodynamics, Linear programming, Analysis, Analytical techniques, Surface tension, Convection, Temperature. Identifiers: *Thermally induced instability, Linear stability analysis, Maraagoni number, Rayleigh number, Cellular convection, Fluid depth ratios,

A linear stability analysis for two initially motionless, viscous immiscible fluids confined between
horizontal isothermal solid surfaces and subject to
both density (Benard) and surface-tensiongradient (Marangoni) driving mechanisma is
presented. Calculations for the laboratory configuration reported predict instability for heating from
above or below. Response is strongly dependent
on the ratios of the properties of the fluids, the
total depth of the layer and the depth fraction of
one fluid. Three different response modes occur,
depending on the fluid depth fractions. When the
heating is from above, the buoyancy mechanism is
stabilizing for most wavenumbers, including the
critical one. Heating from below lowers the critical
Marangoni number and adds a buoyancy driven
response mode. In the experimental study, no instability was detected in any case for heating from
above, even though the Marangoni number exceeded the predicted critical value by as much as
five times. The critical Rayleigh number observed
for heating from below falls between the critical
values predicted with and without the Maragoni
effect. The presence of surface contamination is
believed to be responsible for the apparent lack of
convection when heating is from above and for the
difference between the predicted and measured
critical Rayleigh number when heating is from
below. (Jerome - Vanderbilt)

WAVE REFLECTION AND TRANSMISSION AT PERMEASHE BERAKWATERS,
Massachusetts Inst. of Tech., Cambridge. Ralph
M. Parsons Lab. for Water Resources and
Hydrodynamics.

C. K. Sollitt, and R. H. Cross, III.

Available from NTIS, Springfield, Va., 22151, as
AD-745 922, Price 53.00 printed copy; 30.95
microfiche. Massachusetts Institute of Technology
Department of Civil Engineering Report No
147, March, 1972 235, 94 7 fig. 11 tab, 31 ref., 7 append. DACW-72-68-C-0032.

Descriptors: "Breakwaters, "Coastal structures, "Ocean waves, "Retaining walls, Porosity, Model studies, Theoretical analysis, Design criteria, Correlation analysis, Testing procedures, Physical properties, Hydraulic properties, Coastal engineering. gineering. Identifiers: *Rubble-mound breakwaters.

Rubble-mound breakwaters are designed to protect exposed marine areas from excessive wave activity. Observations of breakwaters interacting with surface waves in laboratory models and in full scale field applications demonstrate that significant wave energy is transmitted through the interstices of structures commonly regarded as being impervious. A theoretical analysis was made to account for this phenomenon. Three breakwaters with vertical walls and homogeneous fill, conventional trapezoidal shape breakwaters with layered fill, and pile array breakwaters with layered fill, and pile array breakwaters with layered fill, and evelopment begins with the unsteady equations of motion for flow in the voids of an arbitrary porous structure. The equations are linearized using a technique which approximates the known turbulent damping condition inside the structure. This yields a potential flow problem satisfied by an eigen series solution. The theory provides useful design estimates for all three breakwater configurations and a full range of wavelengths. The design estimates for all timee breakwater configurations and a full range of wavelengths. The proposed wave-breaking calculation gives favorable results for the sloping face structure tested. (Woodard-USGS) W73-06392

THE INFLUENCE OF DRAG REDUCING POLYMER ADDITIVES ON SURFACE PRESSURE FLUCTUATIONS ON ROUGH SURFACES,

FACES, Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. J. M. Killen, and J. A. Almo. Available from NTIS, Springfield, Va., 22151, AD-749 103, Price \$3.00 printed copy; \$0.95 microfiche. Project Report No 119, September, 1971. 51 p. 22 fig., 1 tab, 22 ref. Navy Contract N00014-67-A-0113-0007.

Descriptors: "Fluid mechanics, "Hydraulics, "Drag, "Flow characteristics, Flow friction, Roughness (Hydraulic), Flow resistance, Testing procedures, Additives, Polymers, Surface tension, Pressure, Fluctuations, Boundary layers, Design criteria, Engineering, Hydraulic structures.

The effect of drag reducing polymer additives on the surface pressure fluctuations on smooth and rough surfaces in relative motion with water was the surface pressure fluctuations on smooth and rough surfaces in relative motion with water was determined. Changes in surface pressure fluctuation intensity were closely related to changes in surface shear when shear change was caused by either the addition of drag reducing polymer or a change in surface roughness, or by both of these. The surface pressure fluctuation measurements were made in a rotating cylinder test facility. The facility consists of a cylinder 1 ft in diameter and 1 ft long positioned to rotate axially in a cylindrical steel tank 6 ft in diameter and 6 ft deep. The rotating cylinder was supported by a hollow stainless steel shaft which was mounted in two waterlubricated rubber bearings. The bearing on the driven (upper) end of the shaft was mounted in a wooden frame separated from the tank. A 'V' belt drive transmitted power from an electric motor drive. This system was necessary to reduce machinery noise enough that it could be neglected in most pressure measurements. (Woodard-USGS) W73-06394 THE ACTIVE LENGTH OF WELL SCREENS (KUTSZUROK AKTIV HOSSZANAK VIZ-SGALATA),

G. Kovacs. Vizugyi Kozlemenyek, No 4, p 393-404, 1972. 3 fig. English summary.

Descriptors: *Well screens, *Hydraulics, Water yield, Water wells, Withdrawal. Identifiers: *Hungary, *Well screen hydraulics.

Identifiers: "Hungary, "Well screen hydraulics.

Discharge measurements performed at different depths over the screened length of operating wells show the inflow to be unevenly distributed over the length of the screen. The problem of economic filter length was studied by theoretical examination of pressure distribution. Owing to the much higher resistance along the well screen the difference in pressure at different heights of the screen may be considerable. Because the rate of flow entering the screen is proportional to the difference in pressures at the external boundary surface and within the well screen, a section may be reached where the sum of resistances acting along the screen section becomes large enough to balance the inflow potential. The expressions relating head loss, specific inflow and the total well yield are given for filters of infinite length. This approach is then repeated to find methods for describing the case of aquifers of finite thickness, or filters of finite length. The method can be extended for estimating the hydraulic parameters of wells drawing water from several layers. (Knapp-USGS)

SEPARATION OF COMBINED WASTEWATER AND STORM DRAINAGE SYSTEMS, SAN FRANCISCO STUDY AREA. Brown and Caldwell, Inc., San Francisco, Calif.

Prepared for American Society of Civil Engineers, New York, New York, September 1968. 79 p, 23 fig, 18 tab, 13 ref.

Descriptors: *Sewerage, *Water pollution control, *Combined sewers, *Separated sewers, California, Economic feasibility, Construction costs, Sewage systems, Municipal wastes, Sewage treatment, Water pollution control, Sewers, Bays. Identifiers: San Francisco (Calif).

The cost of separating combined sewers was studied in a part of San Francisco. Having a gross area of 323 acres with a population of 22,000, this study area is predominately residential and has 2773 structures of all types. Two sewerage systems were studied—a gravity system for \$8.8 million and a pressure system at a cost of \$13 million. A major cost for both systems is the construction of drains from the structures to the street storm sewer, for collecting rain water. For a gravity system this would cost \$5.4 million out of the total project cost of \$5.8 million For a pressurized ty system this would cost \$5.4 million out of the total project cost of \$8.8 million. For a pressurized system, the separation of house drains accounts for \$4.4 million out of the total project cost of \$13 million. The pressurized system has an additional cost incurred by the need for grinder-pump assemblies for each building. Total project cost per structure is \$3,170 for a gravity system, \$4,700 for a pressurized system is not justified except in a downtown area, because the pressurized system requires fewer street disruptions, although system failures will be more common for the pressurized system. (Poertner)

8C. Hydraulic Machinery

AMERICAN STANDARD FOR VERTICAL TUR-BINE PUMPS. American Water Works Association, New York. For primary bibliographic entry see Field 08G. W73-05919

Field 08-ENGINEERING WORKS

Group 8C-Hydraulic Machinery

ECOLOGICAL BENEFITS OF HYDRAULIC DREDGING, Ellicott Machine Corp., Baltimore, Md.

T. M. Turner.

T. M. Turner.

Meeting Preprint No 1874, American Society of Civil Engineers National Water Resources Engineering Meeting, Washington, D.C., January 29-February 2, 1973. 13 p, 6 ref.

Descriptors: "Dredging, "Water pollution control, "River beds, "Desilting, Sediments, Ecology, En-vironment effects, Environmental control, Benefits, Pollution abatement, Hydraulic con-duits, Hydralic systems, Sediment control, Chan-nel improvement, Excavation, Hydraulic mining. Identifiers: "Schuylkill River (Penn).

With the current national concern about man's environment, dredging is often cited as contributing towards pollution of our waterways. Although, in past years, development was often accompanied by environmental degradation, this is no longer the case. Dredging, if done properly, is of great environmental benefit. There are two major types of dredging - hydraulic and mechanical. Mechanical dredging consists of scooping-up sediment by mechanical means and carrying it to the water surface where it is deposited on barges and later transported to a disposal site. The movement of the scooping equipment along the bottom, as well as the transporting of the dredged material through the water, creates turbulence and pollution. Hydraulic dredging, however, operates by sucking the sediment from the bottom and transporting it to the point of disposal. This greatly reduces the amount of turbulence and ecological disruptions. The process of dredging, when done properly, can restore rivers, beaches, lakes and reservoirs. An example of a restored river is the Schuylkill River near Philadelphia which became polluted by industrial coal mine and sanitary wastes. Removal of the muck from the river bottom restored the River to a condition which now supports aquatic life, and it has become a valuable asset to the area. (Poertner) With the current national concern about man's encondition which now supports aquatic life, and it has become a valuable asset to the area. (Poertner) W73-05941

STUDY OF VARIOUS POSSIBLE DESIGNS FOR WATER INTAKE AND OUTLET SYSTEMS OF LARGE POWER STATIONS, CONSIDERING HYDRAULIC PLANT OPERATING PROBLEMS AND SITE SUITABILITY, (QUELQUES CONSIDERATIONS SUR LE CHOIX DU SYSTEME PRISE-REJET DES GRANDS AMENAGEMENTS THERMIQUES SELON LEUR LOCALISATION) TION), Laboratoire National d'Hydraulique, Chatou

(France). J. C. Lebreton, and R. Bonnefille.

La Houille Blanche, No 2-3, p 199-203, 1972. 8 fig.

Descriptors: "Thermal pollution, "Nuclear power-plants, "Currents (Water), "Intakes, "Outlets, Hydraulic engineering, Sediment, Sediment trans-port, Dispersion, Estuaries, Tides, Estuarine en-vironment, Shore line, Harbors, Density currents, Ecology, Offshore platforms, Electric power production.

The various hydraulic, sediment-transport, heat dissipation and ecological problems associated with nuclear power plants situated on estuaries, the sea coast, or in ports are discussed, in relationship to the water intake and outlet systems for these plants. In estuaries the intake and outlet these plants. In estuaries the intake and outlet system must be designed according to the cooling capacity available and in consideration of the effects of thermal pollution and current diversion not just on the site locality but upon the estuary as a whole. For coastal areas recycle problems created by tidal shifts add another dimension to design models, which could be remedied by building the plants on man made islands off the coast. In ports the problems are greatly reduced, although danger to shipping resulting from current diversion must be considered. (Jerome-Vanderbilt) W73-06368

SEQUENCING OF INTERDEPENDENT HYDROELECTRIC PROJECTS, California Univ., Los Angeles. Graduate School of Management.
For primary bibliographic entry see Field 04A.
W73-06445

CONTROLS FOR A SMALL WATER UTILITY, American Water Works Service, Co., Inc., Had-donfield, N.J. For primary bibliographic entry see Field 05F. W73-06466

SWIRL CONCENTRATOR, For primary bibliographic entry see Field 05D. W73-06468

8D. Soil Mechanics

UPSTREAM DRAINAGE INCREASES SPILL-WAY STABILITY, Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08A. W73-05947

ENVIRONMENTAL PROTECTION MEASURES AT MARTIS CREEK, CALIFORNIA, Army Engineer District, Sacramento, Calif. For primary bibliographic entry see Field 08A. W73-05948

EXAMPLES OF THE APPLICATION OF SOILS MECHANICS TO WATER PLANT CONSTRUC-

TION, Saint Louis County Water Co., University City,

Mo. S. H. Lyle, and H. M. Reitz.
Paper presented at the Ninety-First American
Water Works Association Annual Conference,
Denver, Colorado, June 15, 1971. 43 p, 32 fig.

Descriptors: "Soil mechanics, "Water works, "Foundation investigations, "Groundwater move-ment, Missouri, Foundations, Seepage, Soil sta-bility, Soil water movement, Construction, Seepage control, Groundwater barriers, Ground-water discharge, Foundation failure. Identifiers: "St. Louis (Missouri).

Both good and bad experiences with subgrade conditions in the vincinity of St. Louis, Missouri are described. The problems discussed include: (1) seepage and permeability, (2) subsurface drainage, (3) subterranean vertical erosion, (4) subgrade overburden, (5) soil expansion, and (6) tilting pedestals. The experiences offer some good solutions to problems which probably occur at many facilities around the world. Most problems were solved with the help of a soils consultant. One example described was the interference of a facility on subsurface hillside drainage. This project involved the construction of a 36 mgd water treatment plant which resulted in the surfacing of groundwater near the basins and leakage of presed levees close to the Missouri River. It was found that this water was natural subsurface water and not basin water and was due to the interrupand not basin water and was due to the interrup-tion of the groundwater flows. A two-foot thick layer of sand was placed over the surfacing water to prevent soil erosion from the substrata, but this merely caused surface water springs to appear in neighboring fields. The problem was eventually neighboring fields. The problem was eventually solved by constructing wells, pumping the water into pre-sed basins and lowering the groundwater level sufficiently to prevent future problems. Other seepage problems have required drain tiles to be installed. A problem of groundwater pressure from under a rapidly-drained basin causing basin wall upheavals was solved by limiting the rate of the draining of the water basin. (Poertner) W73-05952

ANALYSIS OF ERRORS IN LOGGING PARAMETERS AND THEIR EFFECTS ON CAL-CULATING WATER SATURATION, Alcore Co., Dallas, Tex. For primary bibliographic entry see Field 08G. W73-06197

REMOTE SENSING FOR WATER RESOURCES, Georgia Inst. of Tech., Atlanta. Dept. of Civil En-For primary bibliographic entry see Field 07B. W73-06255

8E. Rock Mechanics and Geology

DEEP STRATIGRAPHIC TEST WELL NEAR ROCK ISLAND, ILLINOIS, Illinois State Geological Survey, Urbana. For primary bibliographic entry see Field 08B. W73-05913.

ASSOCIATION OF SALINITY VARIATIONS AND GEOPRESSURES IN SOFT AND HARD ROCK, Continental Oil Co., Ponca City, Okla. For primary bibliographic entry see Field 08B. W73-05929

PIPELINE CROSSINGS, Ottawa Univ. (Ontario). For primary bibliographic entry see Field 08A. W73-05940 FOR SUBMARINE

GEOTHERMAL RESOURCE INVESTIGA-TIONS, Bureau of Reclamation, Boulder City, Nev. Reon 3. For primary bibliographic entry see Field 03B. W73-05943

UPSTREAM DRAINAGE INCREASES SPILL-WAY STABILITY, Army Engineer District, Kansas City, Mo. For primary bibliographic entry see Field 08A. W73-05947

MAP SHOWING RELATIVE PERMEABILITY OF ROCKS AND SURFICIAL DEPOSITS OF THE ASFEN QUADRANGLE, PITKIN COUNTY, COLORADO, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-06175

MAP SHOWING INFERRED RELATIVE PERMEABILITY OF GEOLOGIC MATERIALS FERMEABILITY OF GEOLOGIC MATERIALS IN THE PARKER QUADRANGLE, ARAPAHOE AND DOUGLAS COUNTIES, COLORADO, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 07C. W73-06177

AN INVESTIGATION OF PERMEABILITY, POROSITY, AND RESIDUAL WATER SATURA-TION RELATIONSHIPS, Chevron Research Co., La Habra, Calif. For primary bibliographic entry see Field 08G. W73-06198

TRICORE, A CONTINUOUS SIDEWALL CORE CUTTER, Lane-Wells Co., Houston, Tex. For primary bibliographic entry see Field 08G.

8F.

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CATH STEE Olin M J. F. B REMOTE SENSING FOR WATER RESOURCES. Georgia Inst. of Tech., Atlanta. Dept. of Civil Engineering.
For primary bibliographic entry see Field 07B.
W73-06255

THE EFFECT OF TEMPERATURE ON WAVE VELOCITIES IN POROUS ROCKS, California Univ., Berkeley. Coll. of Engineering. S. A. M. Mobarek. M Sc Thesis, 1971. 83 p, 25 fig, 9 tab, 49 ref. OWRR A-042-CAL (1).

Descriptors: *Rock mechanics, *Rock properties, *Sandstones, *Geophysics, Petrology, Oil reservoirs, Geology, Model studies, Testing procedures, Temperture, Pressure, Porosity, Geochemistry, Instrumentation, Equipment, Sonar, Sound waves, Rocks.

Sonar, Sound waves, Rocks.

A knowledge of wave velocities in rocks and factors affecting them is of considerable interest in the fields of petroleum engineering, geophysics and geological engineering. The variations in dilatational velocities of sandstones with pressure and temperature were measured. Measurements were made for dry and silicone oil saturated Berea, Bandera and Boise sandstones at pressures up to 700 Kg/sq cm and at temperatures of 20, 100, and 200 deg C. Effects of temperature on dilatational velocity were predicted from known data on effects of temperature on velocity-related rock properties. Experimental results showed a marked decrease in dilatational velocity with increased demperature. The decrease was larger for liquid-saturated samples than dry samples. Effects of temperature were more pronounced at lower pressures for dry sandstones and nearly constant for deep, high temperature formations give errors in porosity values. Correction charts for sonic log interpretation take into consideration effects of temperature and pressure on sonic velocity. (Woodard-USGS)

8F. Concrete

NEW DEVELOPMENTS IN SONIC WAVE TRAIN DISPLAY AND ANALYSIS IN CASED TRAIN DISPLAY AND ANALYSIS IN CASED HOLES, Schlumberger Surenco S.A., Caracas (Venezuela). For primary bibliographic entry see Field 08G. W73-05934

PREDICTION OF INTERZONE FLUID COM-MUNICATION BEHIND CASING BY USE OF THE CEMENT BOND LOG, Shell Oil Co., Deaver, Colo. For primary bibliographic entry see Field 08G. W73-06201

THE USE OF THE CEMENT BOND LOG IN WELL REHABILITATION, For primary bibliographic entry see Field 08G. W73-06203

TEMPERATURE LOGGING, Worth Well Surveys, Inc., Odessa, Tex. For primary bibliographic entry see Field 08G. W73-06204

8G. Materials

CATHODIC PROTECTION TO PREVENT CREVICE CORROSION OF STAINLESS STEELS IN HALIDE MEDIA, Olin Metals Research Labs., New Haven, Conn.

Corrosion, Vol 29, No 1, p 28-32, January, 1973, 7 fig. 12 ref, append

Descriptors: *Corrosion, Corrosion control, *Cathodic protection, *Stainless steel, Pitting (Corrosion), Polarity, Materials testing, Hydrolysis, Acidity, Chlorides, Salts, Electrochemistry. Identifiers: *Polarization, Salt bridge, Crevice control of the contro

rosion, Agar.

Crevice corrosion greatly restricts the use of stainless steels in chloride media. To aid in overcoming this difficulty a laboratory study was made of the stages of development of naturally occurring crevice corrosion. Also studied were the response of crevice and bulk specimen to cathodic polarization. The development of naturally occurring crevice corrosion was followed by mensuring the potential within the crevice. Typically, there were three relatively rapid changes in potential separated by plateaus in the potential-time crew. These changes are postulated to correspond to (1) oxygen depletion in the crevice, (2) passivity breakdown in the crevice, and (3) acidification in the crevice. It was shown that crevice corrosion can be stopped by extended polarization somewhat more noble than the protection potential, and that on specimens with multiple active crevices some will be stifled at lower current densities than others. The findings indicate that intermittent application of cathodic protection can suppress crevice corrision with a consequent power saving compared with the cost of continuous protection. (Smith-NWWA)

TEMPERATURE AS A PITTING CRITERION, Endako Mines Ltd., Ottawa (Ontario). R. J. Brigham, and E. W. Tozer. Corrosion, Vol 29, No 1, p 33-35, January, 1973. 3 fig, 3 tab, 3 ref.

Descriptors: Corrosion, *Corrosion control, Materials, *Materials testing, *Molybdenum, Steel, Oxidation-reduction potential, *Pitting (Corrosion), Alloys, Laboratory tests, *Tempera-Identifiers: Activity (Chemical), *Critical pitting temperature, Austentitic alloys.

On the basis of three independent test methods, two potentiostatically controlled and one freely corroding, temperature has been shown quantivatively to be an important criterion for describing the onset pitting corrosion in molybdenum containing austentic stainless steels. A strong dependence on temperature and not on potential of oxidizing solutions suscept that there write for existing the street of the control of the c dence on temperature and not on potential of oxidizing solutions suggests that there exists for each wholly austentitic steel a critical pitting temperature below which the steel will not pit regardless of potential and exposure time. This critical pitting temperature is shown to depend in a regular way on the Mo content of the steel. However, these data are valid only for pit nucleation on a flat surface. Preliminary results indicate that these temperature values should be reduced considerably to describe the onset of edge or crevice attack, which consequently appear to constitute a more likely mode of failure than pitting. (Campbell-NWWA) W73-05906

BOREHOLE GEOPHYSICAL METHODS FOR ANALYZING SPECIFIC CAPACITY OF MUL-TIAQUIFER WELLS, Geological Survey, Washington, D.C. G. D. Bennett, and E. P. Patten, Jr. Water-Supply Paper 1536-A, 1960. 25 p, 8 fig, 2 tab, 12 ref.

Descriptors: Wells, Water wells, Logging (Recording), Electrical well logging, "Specific capacity, Boreholes, "Borehole geophysics, Drawdown, Discharge (Water), Flow measurement, Hydrology, Groundwater, "Aquifer characteristics, Aquifer testing.

Identifiers: *Multiaquifer wells, Thieving, Well

hydraulics.

Conventional well-logging techniques, combined with measurements of flow velocity in the borehole, can provide information on the discharge-drawdown characteristics of the several aquifers penetrated by a well. A method is shown for determining the discharge-drawdown characteristics whereby a well is pumped for a certain length of time at a steady rate. While the well is being pumped, measurements are made of drawdown and of the discharge rates of the individual aquifers within the well. Discharge rates and drawdown as re usually recorded as functions of time, and their values for any given time during the test are obtained by interpolation. The procedure is repeated for several different rates of total well discharge. The well may be allowed to recover after each step, or discharge may be changed from one rate to another, and changes in discharge and drawdown may be measured by extrapolation. The flow measurements within the well may be made by use of a subsurface flowmeter or by one of several techniques involving the injection of electrolytic or radioactive tracers. The method was found to provide much useful information on aquifer yields, 'thieving,' and hydrostatic heads of the individual zones. (Smith-NWWA)

AMERICAN STANDARD FOR VERTICAL TUR-BINE PUMPS.

American Water Works Association, New York.

AWWA E101, 1961, 49 p. 17 fig. 7 tab, append.

Descriptors: *Pumps, Specifications, *Standards, Materials, Wells, *Water wells, Drawdown, Specific yield, Pump turbines, Discharge (Water), Head loss, Friction, Steel, Inspection, *Testing

procedures.
Identifiers: *Vertical turbine pumps, Submersible pumps, Line shaft pumps, Nomenclature, Engineering data, *Field testing.

This Standard is recommended as a guide for users of the line shaft and submersible vertical turbine pumps in selecting new equipment. The suggested standards are to be considered a minimum requirement for a first-quality vertical turbine pump, but do not preclude the use of more elaborate specifications on the part of either user or manufacturer. The standards for submersible pumps apply to those using a 7 1/2-hp motor or larger. This standard is applicable primarily to pumps that are constructed of accepted standard materials of the best quality and workmanship. For each type of pump, line shaft and submersible, definitions of the pump and its operation are given, along with the pump nomenclature, general specifications, engineering data, and factory inspection and test data. An appendix dealing with field testing of vertical turbine pumps is included. (Smith-NWWA)

THE EVALUATION OF CLAY CONTENT

THE EVALUATION OF CLAY CONTENT FROM LOGS, Echnical Services, Paris (France). A. Poupon, and R. Gaymard. In: Society of Professional Well Log Analysts, 11th Annual Logging Symposium, p Gl-G21, May 3-6, 1970. 18 fig. 7 ref.

Descriptors: Wells, *Logging (Recording), Electri-cal well logging, Radioactive well logging, Gamma rays, *Clay minerals, Indicators, *Well data, Boreholes, Resistivity, Porosity, Density, Sound waves.

Identifiers: Neutron logging, *Formation evalua-

Since many log readings are substantially affected by clay in the formation, a reliable evaluation of the clay content is essential in formation evalua-

Field 08-ENGINEERING WORKS

Group 8G—Materials

tion from logs. The method presented to solve this complex problem is based on the consideration of several 'clay indicators' evaluated statistically over the interval of the well to be interpreted. These indicators are either single curves such as the SP, Gamma Ray, or Neutron, or combinations of two curves such as Neutron and Density logs. Each clay indicator is calibrated so as to give either the actual clay content or an upper limit of that value. Then the lowest of these indications is likely to be very close to the actual value. The method is applicable not only for shaly sands, but also for complex lithologies. The method described is incorporated in various computer programs. The results of the clay content evaluations made possible good determinations of porosities and water saturations for a considerable range of conditions. (Smith-NWWA)

NEW DEVELOPMENTS IN SONIC WAVE TRAIN DISPLAY AND ANALYSIS IN CASED HOLES

Schlumberger Surenco S.A., Caracas (Venezuela). H. D. Brown, V. E. Grijalvz, and L. L. Raymer. In: Society of Professional Well Log Analysts 11th Annual Logging Symposium, p F1-F25, May, 3-6, 1970. 12 fig, 1 tab, 6 ref.

Descriptors: Logging (Recording), Wells, *Well data, Well casings, Boreholes, *Sound waves, Cement grouting, Hydraulics, Data transmission, Electrical well logging, Gamma rays, Radioactive well logging, *Borehole geophysics. Identifiers: *Sonic velocity, Cementing, *Cement bond log, Annular space, Field testing.

Simultaneous recording of the full-wave display (Variable Density Log) with the first-arrival amplitude (Cement Bond Log) has been useful in analyzing cementation quality. For the CB, a short spacing is desired in order to show more clearly the attenuation rate of the casing arrival. For the VDL, however, a longer spacing is desired in order to show the formation arrivals in well bonded intervals. To satisfy these differing requirements, a two-receiver system is being used to provide a 3-foot spacing and a 5-foot spacing simultaneously. New recording equipment permitty on the same film. Problems of separate film processing and depth mismatch are thus eliminated. Field examples show that this combination of the long-spacing VDL with the short-spacing CBL can provide a more thorough understanding of cementation quality. Cases of microannulus and cement channeling, as well as good and poor cement bond, can be recognized. Rules are proposed which equate CBL-VDL. response with hydranlic-seal effectiveness. These have been derived from comparisons of the CBL-VDL. response with isolation tests in actual field wells. Field examples illustrate the interpretation techniques. (Campbell-NWWA)

THE DETECTION AND MAPPING OF SUBTER-RANKAN WATER BEARING CHANNEL, Missouri Water Resources Research Center, Rolla. For primary bibliographic entry see Field 04B. W73-06034

A SIMPLE APPARATUS FOR THE RAPID AND ACCURATE DETERMINATION OF BULK DEN-SITIES OR VOLUMES OF ROCK OR MINERAL FRACMENTS, State Univ., of New York, Buffalo.

State Univ., of New York, Buffalo. For primary bibliographic entry see Field 02J. W73-06160

THE REDOX LOG,
I. I. Veneziani, S. J. Pirson, V. Colombo, and M.
B. Broome.

In: Thirteenth Annual Logging Symposium, Society of Professional We² Log Analysts, p D1-D19, May 1972.

Descriptors: Logging (Recording), "Electrical well logging, "Electrical equipment, Drilling fluids, Mineral industry, Oil industry, Sulfur, "Exploration, Stratigraphy, Instrumentation. Identifiers: "Ore deposits, "Uranium, "Redox logs.

The example Redox Logs presented and discussed establish their value in sedimentary uratium exploration as they provide the best log devised heretofore in order to characterize the sedimentation processes in which the habitats of Uranium ore bodies are expected. The principles of interpretation presented in some detail may be extrapolated to the search for other sedimentary mineral accumulations including oil, gas and native sulfur. The following topics are discussed: theory, instrumental design and field operating techniques, example logs and their interpretation in terms of uranium accumulations with extension to the study of sedimentary environmental sequences of deposition. Differences in performance between SP and Redox logs are: (1) The SP curve measures but a small fraction of total redox potential contrast between formations whereas the Redox log may measure a large fraction of this contrast. (2) Unlike SP logs, Redox logs have given satisfactory performance in low resistivity (salt) mads. (3) The SP curve appears as a subdued curve of Redox potential contrast. (Campbell-NWWA) W73-06193

THE NEGLECTED SP CURVE, Texas Univ., Austin. S. J. Pirson, and K. Y. Wong. In: Thirteenth Annual Logging Symposium, Society of Professional Well Log Analysts, p Cl-C16, May 7-10, 1972. 11 fig, 1 tab, 9 ref.

Descriptors: Logging (Recording), *Electrical well logging, *Electrodes, Electrical properties, Electrical equipment, *Materials, Metals, Temperature, Drilling fluids, Ions, Ionization, Ion transport, Measurement. Identifiers: *Spontaneous potential, Electrode potential, Electromotive force.

Base line drifts are a function of electrode metal, formation temperature and mud composition. Great improvements in SP curves would be realized by the use of pressure compensated reference electrodes such as Ag-AgCl. SP curve interpretation has been hampered by unstable electrodes and by the universal use of Nernst's fallacious concept that electron transfer at the electrodes is thermodynamically reversible. Five metallic electrodes investigated in laboratory measurements of electrode potentials were: Silver, Platinum, Iron, Lead, and Tungsten. Some conclusions were: (1) The electrode potential values of Tungsten, Lead, and Iron electrodes were positive in the range of temperature (25 to 80 degrees C.) investigated on all the muds. (2) The potential of Lead and Iron electrodes becomes less positive with increase in temperature. The Tungsten electrode, however, became more positive. (3) The potential of the Silver electrode increased, like the Tungsten electrode, with increasing temperature. However, the potential of the Silver electrode was negative, and not positive, as with the Tungsten electrode. (4) With the Platinum electrode the results obtained were unstable. The degree of instability is incitated by erratic potential variations increasing or decreasing with temperature of the mud. (Smith-NWWA)

A RESUME OF SPONTANEOUS POTENTIAL MEASUREMENTS, Teton Exploration Drilling Co., Casper, Wyo. J. K. Hallenburg.

In: Twelfth Annual Logging Symposium, Society of Professional Well Log Analysts, p H1-H15, May 7-10, 1971. 18 fig, 11 ref.

Descriptors: Logging (Recording), "Electrical well logging, Instrumentation, "Electrochemistry, Ions, Ionization, "Ion transport, Electrolytes, Boreholes, Diffusion, Absorption, Electrodes. Identifiers: "Spontaneous potential logging, Electrofibration."

The potentials which are measured as an SP curve are thought of as being made up of two components, the electrochemical and the electrofiltration. Electrode effects are shown to be also important. The primary source of the electrochemical component is a difference in ion concentration and mobility; this component can be influenced by both the fluid and matrix makeup. The electrofiltration component arises from differential pressures and ion composition. The electrode itself causes baseline shifts and deflections from which useful information may be gained. Operation of equipment in such a manner so as to reduce or eliminate spurious effects is emphasized. Future work with SP will be in interpretation of the SP curve and the design of instrumentation so as to select useful parameters and reject others. (SmithNWWA)

NEUTRON ACTIVATION FOR ELEMENTAL DETERMINATION IN BOREHOLES, Dresser Atlas, Houston, Tex.

P. A. Wichmann.
In: Twelfth Annual Logging Symposium, Society
of Professional Well Log Analysts, p G1-G18,
May 7-10, 1971. 15 fig, 15 ref.

Descriptors: Logging (Recording), "Radioactive well logging, "Neutron activation analysis, Elements (Chemical), "Application methods, Lithologic logs, Instrumentation, Gamma rays, Radioactivity, Isotope studies, On-site investigations.

Identifiers: Half-life, *Radioactive decay.

Some of the neutron activation logging methods which have been used over the past few years are reviewed. Due to the state of the art for activation logging instruments, these methods depend almost entirely on the half lives and radiation intensity of the activation products. The elements which are most conveniently identified in this manner include oxygen, silicon and aluminum. Field examples of the logs and/or measurements involved in each of these determinations are included. The application and relative value of each of these determinations, the limitations of the presently available field techniques, and possible solutions of the limiting problems are discussed. The most likely solution of these problems is primarily related to the use of gamma spectral measurements to define the activation products. Field examples of test data that support the validity of these solutions are also presented. The method is shown to be a viable approach for determining lithologic components (through elemental assay) in well bores containing a wide range of conditions. While having certain limitations, the techniques described in the elemental on the methods described in the literature tend to be indirect or empirical approaches. (Campbell-NWWA)

ANALYSIS OF ERRORS IN LOGGING PARAMETERS AND THEIR EFFECTS ON CAL-CULATING WATER SATURATION, Alcore Co., Dallas, Tex. C. Khelil.

C. Khelil. In: Twelfth Annual Logging Symposium, Society of Professional Well Log Analysts, p A1-A17, May 7-10, 1971. 3 tab, 11 ref, append. Descrip logging, *Resisti Estimat Identifie

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POROSI TION RI Chevron A. Timus In: 9th Professi 26, 1968.

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A STUDY Continen E. P. Mie In: 8th A Professio 1967, 1 tai

Descripto *Electrica Drill hole Mud. Identifier Diameter

Empirical invasion, ty, RT, as times, and obtain the calculated Descriptors: Logging (Recording), Electrical well logging, Porosity, *Mathematical studies, Clays, *Resistivity, Saturation, Computer programs, Estimating equations. Identifiers: *Water saturation.

A method is presented to evaluate the effects of errors in porosity, water resistivity, saturation exponent, clay coatent, clay resistivity, and true resistivity on the calculation of water saturation. This method can be used in two ways: (1) As a standard procedure to evaluate the reliability of water saturation for each point or interval in a log analysis computer program, or (2) as a tool to evaluate an overall order of magnitude of the accuracy of water saturation calculation given the lower and upper limits of each parameter. An analysis of a practical case shows under what conditions each one of the parameters must be measured more accurately. More laboratory studies of a fundamental nature should be made to investigate various factors affecting the parameters used in the water saturation equation. (Smith-NWWA)

AN INVESTIGATION OF PERMEABILITY, POROSITY, AND RESIDUAL WATER SATURA-TION RELATIONSHIPS, Chevron Research Co., La Habra, Calif.

Chevron Assessed Conversed Con

Descriptors: Drilling, "Porosity, "Permeability, Sandstones, Sampling, Logging (Recording), "Electrical well logging, Equations, Saturation, Wells, Mathematical studies. Identifiers: Empirical equations, "Residual water saturations, Petroleum reservoirs.

A reasonably accurate relationship for estimating permeability of sandstones from in situ measurements of porosity and residual fluid saturation would be instrumental in eliminating the expense of coring. To establish such a relationship measurements of permeability, porosity, and residual water saturation were made on 155 sandstone samples from three different oil fields in North America. The general relationship from the test results was put in the form of an empirical equation. To simplify its use, this equation was plotted in the form of a chart from which the value of permeability can be obtained, by entering the respective form of a chart from which the value of permea-bility can be obtained, by entering the respective values of porosity and residual water saturation. The estimating of residual water saturation in sandstones, when porosity and permeability are known, was also investigated by testing several possible relationships. The best one was found to estimate residual water saturation from a combina-tion of measurements of porosity and permeabili-ty, with a standard error of 13% pore volume. (Smith-NWWA)

A STUDY OF INVASION DIAMETER, Continental Oil Co., Ponca City, Okla. E. P. Miesch, and J. C. Albright. In: 8th Annual Logging Symposium, Society of Professional Well Log Analysts, p 01-014, June 1967, 1 teh. 2 and 2 areas 1967. 1 tab, 2 ref, 2 app

Descriptors: *Drilling fluids, Logging (Recording), *Electrical well logging, Drillers logs, Drilling, Drill holes, Gels, Computer programs, Saturation, Mud. Identifiers: Formation damage, *Mud invasion, Diameter of filtrate invasion.

Empirical correlations for the diameter of filtrate invasion, 'DI', and for the true formation resistivity, RT, as a function of mud properties, exposure times, and formation properties are presented. To obtain the correlations, 'DI' and RT values were calculated using Dual Induction Laterolog-8 logs through 676 zones from 26 wells in Oklahoma,

Texas, Arkansas, Kansas, and New Mexico. Equations were obtained which predicted 'DI' with an average absolute deviation of 41.8 percent which in turn yielded an average absolute deviation of 13.1 percent for RT when good values are available for RXO and RILD, the deep induction log readings. The correlations are not oriented for hand calculations, but are readily adapted to a computer logging program. (Campbell-NWWA) W73-06199

TRICORE, A CONTINUOUS SIDEWALL CORE

CUTTER, Lane-Wells Co., Houston, Tex.
H. B. Watt, and T. B. Akin.
In: 8th Annual Logging Symposium, Society of Professional Well Log Analysts, p U1-U9, June 1967. 4 ftg, 2 tab.

Descriptors: Drilling, Drilling fluids, Sampling, Cores, *Core drilling, Core logging, *Logging (Recording), *Rock properties, Lithologic logs, Boreholes. Identifiers: Mud invasion.

A wireline coring device is introduced. It saws a 60 inch long triangular sample of formation with a pair of cutters which move along the borehole wall parallel to the axis of the tool. The formation sample retrieved is undisturbed by the cutting operation and retains the mud cake in place on the surface adjacent the borehole. Cores may be taken in boreholes 7-7/8 inch diameter or larger. This device makes it possible to retrieve continuous sorenoies 1-1/8 inch diameter or imper. This device makes it possible to retrieve continuous cores in selected zones for quantitative determination of rock properties and for qualitative examination of strata characteristics such as dip and amination of strata characteristics such as tip and fracturing. Correlation and comparison of these triangular cores with logging measurements pro-vide a new means for studying the effects of mud-cake and invasion. Results of field tests are discussed and the characteristics of retrieved rock samples and mud cakes are described. (Campbellsamples and NWWA) W73-06200

PREDICTION OF INTERZONE FLUID COM-MUNICATION BEHIND CASING BY USE OF THE CEMENT BOND LOG, Shell Oil Co., Deaver, Colo.

G. R. Pickett.

In: 7th Annual Logging Symposium, Society of Professional Well Log Analysts, p J1-J27, May 1966. 13 fig. 5 ref.

Descriptors: *Logging (Recording), Grouting, *Cement grouting, Wells, Well casings, Acoustics, *Sound waves, Wavelengths.
Identifiers: Gilsonite, Micro-annulus, *Amplitude (Waves), Velocity (Sound), *Formation fluids.

(Waves), Velocity (Sound), "Formation fluids.

Quantitative criteria for predicting by the use of the cement bond log whether interzone fluid communication will take place through the casing-formation annulus are derived for cementing and logging conditions on the Cedar Creek Anticline. These criteria consist of a critical amplitude above which communication will take place and critical interzone distance below which communication will take place and critical interzone distance below which communication will take place and critical interzone distance below which communication will take place. These criteria were derived by correlation in 28 wells of conclusive communication tests with cement bond logs which met certain quality control and calibration requirements. Adequate quality control of the cement and bond logs for quantitative application was dependent on four factors: (1) Acoustic properties of fluid in the casing, (2) Satisfactory repeatability, (3) Satisfactory centralization, and (4) Appropriate response in unbonded casing and in unbonded casing collars. Phenomena which significantly affect CBL response but which are not associated with log quality control or with the presence and strength of the cement in the annulus are 'early arrivals' opposite high velocity formations, the apparent presence of a 'micro-annulus' between casing and

cement sheath, and a change in apparent bonding with time when gilsonite cement was used. (Campbell-NWMA) W73-06201

STEREOSCOPIC DEEP WELL PHOTOGRAPHY

IN OPAQUE FLUIDS, Laval Underground Surveys, Fresno, Calif. J. E. Mullins.

In: 7th Annual Logging Symposium, Society of Professional Well Log Analysts, p N1-N9, May 1966. 5 fig.

Descriptors: *Borehole cameras, Boreholes, Wells, Drilling fluids, Opacity, Oil industry, Well casing, *Exploration, *Sampling. Identifiers: *Inflatable packers, Fluid displace-ment, *Opaque fluids, Crude oil.

ment, "Opaque Ituids, Crade oil.

The photography of deep wells in 3-D stereoscopic pairs as used for evaluation of well conditions or formational analysis is discussed. The photographs are obtained in wells and boreholes, containing opaque fluids such as crude oil and drilling muds, by an isolation displacement technique. This is done by means of a hydraulic packer manipulated by a self-contained pumping system capable of pumping well fluid for the packer inflation. The inflation of this packer isolates the area to be photographically inspected. The discussion covers the value of such visible examination of wells and boreholes for structural evaluation of materials, geologic studies of in situ conditions and recovery of lost equipment. Photographs illustrate points of discussion and new techniques developed for operation below opaque fluids. (Campbell-NWWA)

W73-06202

THE USE OF THE CEMENT BOND LOG IN WELL REHABILITATION, J. E. Upp.

In: 7th Annual Logging Symposium, Society of Professional Well Log Analysts, p X1-X11, May 1966.8 fig.

Descriptors: Logging (Recording), *Electrical well logging, Grouting, *Cement grouting, *Well casing, Storage, Michigan, Natural gas, Oil industry, Oil wells, Oil fields, Gamma rays. Identifiers: Well rehabilitation.

A project of rehabilitating some 220 oil and gas wells was undertaken by a Michigan company for the purposes of gas storage and the secondary recovery of oil by gas injection and recycling. Since integrity of the wells was of prime importance in this project, a Cement Bond log was run as a matter of routine in all the wells rehabilitated. This program was supplemented by running Gamma Ray-Neutron logs. The use of the Cement Bond log made it possible to evaluate casing cement jobs under a variety of circumstances. In so doing, its use allowed a more thorough evaluation of wells than was previously possible, without excessive cost. (Smith-NWWA)

TEMPERATURE LOGGING, Worth Well Surveys, Inc., Odessa, Tex. D. R. Peacock. In: 6th Annual Logging Symposium, p F1-F18, May 1965. 12 fig.

Descriptors: *Logging (Recording), *Cement grouting, Grouting, Temperature, Thermal expansion, Testing procedures, Wells, *Thermometers, Oil industry, Well casing, Well data, Exploration. Identifiers: *Temperature logging, *Thermal gradient, Semiconductors, Temperature differential, Squeeze cementing, Hydraulic fracturing.

Field 08-ENGINEERING WORKS

Group 8G-Materials

The use of highly-sensitive and stable temperature logging systems produced data which correlated with earlier theoretical predictions and stimulated the application of temperature logging into areas other than the conventional cement top location. Innovations were chiefly in the concepts of combining gradient with differential logs to get different views of a given temperature anomaly. Also, the techniques of changing well conditions during a series of logs create temperature anomalies which can reveal considerable information about downhole conditions. These techniques are particularly effective in producing injectivity profiles in secondary recovery programs and in evaluating fracturing operations. Field examples are supplied to illustrate the various procedures. (Smith-NWWA) are supplied to i (Smith-NWWA) W73-06204

THE INFLUENCE OF DRAG REDUCING POLYMER ADDITIVES ON SURFACE PRES-SURE FLUCTUATIONS ON ROUGH SUR-FACES,

Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. For primary bibliographic entry see Field 08B. W73-06394

8I. Fisheries Engineering

INVESTIGATION OF CULVERTS AND HYDRAULIC STRUCTURES USED FOR FISH-WAYS AND THE ENHANCEMENT OF FISH HABITAT, Idaho Univ., Moscow. Water Resources Research

Inst. F. J. Watts, P. Bass, C. P. Liou, and M. Harrison. Available from the National Technical Informa-Avanaoie from the National Technical Informa-tion Service as PB-216 809, \$3.00 in paper copy, \$0.95 in microfiche. Research Technical Comple-tion Report, December 1972. 7 p, 13 ref. OWRR A-027-IDA (2). 14-01-001-3212.

Descriptors: *Culverts, *Hydraulic design, *Fish migration, *Aquatic habitat, Orifice flow, Dynamics, Fluid mechanics.

A method for the design of slot orifice fishways for box culverts was developed. Characteristics for a satisfactory fishway are identified. Ap-propriate graphs for sizing slot orifice fishways for a given performance capability of a fish are presented. The hydraulics of slot orifices conpresented. The hydraulics of slot orifices constructed in the face of skewed wingwalls is explained. A table listing the swimming capability of various species of fish was compiled from existing literature. A hodograph for the wake boundary behind a flat plate placed normal to free surface flow was developed. A comparison of the size of wakes produced by a flat plate, a 90-degree wedge and a circular cylinder were made. The shape of wakes produced by embedded sphere with different degrees of submersence was also studied. W73-06029

DROP OF YOUNG AND MATURE FISH ACROSS THE WATERWORKS OF THE NEVIN-NOMYSSKII CANAL WATER SUPPLY SYSTEM

(IN RUSSIAN),
M. S. Popova, and G. P. Ivanova.
Naucha Tr Stavrop S-Kh Inst. 33. p 89-93, 1970.
Identifiers: Canals, *Fish migration, Nevinnomysskii Canal, Species, USSR, Waterworks.

The number of surviving fish which were washed out of the Novotroitskii Reservoir from irrigation of fields to the turbines of the Novotroitskaya Hydroelectric power station was counted. The work was done from Aug. to Dec. 1968. The average daily migration of juveniles in a specific month varied from 32-794 specimens. About 1.5 million underyearlings of commercial fish were counted in only 5 mo. Juveniles migrated more in

Aug. (44%) and Sept. (43%).—Copyright 1972, Biological Abstracts, Inc. W73-06042

EXPERIENCE IN INTRODUCING LAMINARIA

EAPERIENCE IN INTRODUCING LAMINARIA INTO THE DIET OF DOMESTIC CARP UN-DERYEARLINGS; (IN RUSSIAN), N. N. Sidel'nikova, and M. R. Sidel'nikov. Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 3. p 228-237. 1970. English

Identifiers: *Carp underyearlings,

Six experimental ponds of the Savvinskii Fishery, Moscow Oblast, were used. In 2 control ponds Moscow Oblast, were used. In 2 control ponds carp fingerings received a basic diet for carp. In 4 ponds the fish received 3-5% marine algac-Laminaria in addition to the basic diet. The best results were obtained in ponds where yearlings received an additional 5% Laminaria.—Copyright 1972, Biological Abstracts, Inc. W73-06065

FEEDING OF DOMESTIC CARP YEARLINGS ON A DIET WITH LYSINE SUPPLEMENTS AND THE PROTEIN COMPOSITION OF THE BLOOD SERUM (IN RUSSIAN), For primary bibliographic entry see Field 05C. W73-06067

HISTORY AND RESULTS OF FISH INTRODUC-TIONS IN SASKATCHEWAN 1960-1969, Colorado State Univ., Fort Collins. Dept. of Fishery and Wildlife Biology. For primary bibliographic entry see Field 05C. W73-06321

09. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

CATALOG OF RESEARCH REPORTS, PAPERS, BULLETINS AND THESES FOR THE PERIOD JULY 1, 1969 THROUGH JUNE 30, 1971. Colorado State Univ., Fort Collins. Coll. of En-

gineering.
For primary bibliographic entry see Field 10C. W73-06389

9B. Education (In-House)

AN INVESTIGATION OF CURRICULA MATERIALS AND METHODOLOGY FOR TRAINING OPERATORS OF WASTEWATER TREATMENT PLANTS, North Carolina Water Resources Research Inst.,

For primary bibliographic entry see Field 05D. W73-06024

9D. Grants, Contracts, and Research Act Allotments

RESOURCES RESEARCH WATER

WATER RESOURCES RESEARCH IN PENNSYLVANIA, Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. J. Spottheim.

Available from the National Technical Information Service as PB-216 810, \$3.00 in paper copy. \$9.55 in microfliche. Information Report No. 67, 1972. 84 p. OWRR A-023-PA (1). 14-31-0001-3538.

Descriptors: "Pennsylvania, "Projects, Water pol-lution, Groundwater, Runoff, Wastes, Nutrients, Thermal pollution, Streamflow, Waste disposal, Watersheds, Water treatment, Desalination, Chemical properties, Coal mine wastes, Fish, Ecology, Universities, Colleges.

This study covers water resources research projects in Pennsylvania which were in progress or completed within the period December 1, 1970 to June 30, 1972. Research was reported from universities and colleges, state agencies, federal agencies, municipal agencies, public utilities, federal agencies, memory agencies in Pennsylvania, and private industries. An index of investigators keywords for abstracts and for the investigators areas of interest, akey to abbreviations used, and addresses of the institutions engaged in research on water resources are included. An abstract of each research project is included. Approximately 240 research projects are described. (Blakely-Penn State)

WATER RESOURCES RESEARCH COORDINA-TION IN NEW ENGLAND, SUPPLEMENTARY TECHNICAL COMPLETION REPORT, Rhode Island Univ., Kingston. For primary bibliographic entry see Field 06E. W73-06207

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication **And Distribution**

METALS AS POLLUTANTS IN AIR AND WATER,
Ocean Engineering Information Service, La Jolla,
Calif.
For primary bibliographic entry see Field 05A.
W73-06009

BIBLIOGRAPHY OF LIVESTOCK WASTE MANAGEMENT, Iowa State Univ., Ames. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 05G.
W73-06214

CATALOG OF RESEARCH REPORTS, PAPERS, BULLETINS AND THESES FOR THE PERIOD JULY 1, 1969 THROUGH JUNE 39, 1971. Colorado State Univ., Fort Collins. Coll. of En-

Publication CER-70-71DBS69, July 1, 1971. 66 p.

Descriptors: *Engineering, *Bibliographies, *Publications, *Colorado, Universities, Agricultural engineering, Atmospheric physics, Civil engineering, Electrical engineering, Mechanical engineering, Fluid mechanics, Hydraulics, Hydrology, Sanitary engineering, Water management (Applied), Information retrieval. Identifiers: *Colorado State University, College of Engineering.

This catalog presents a list of Colorado State University publications prepared by the faculty, research staff and students of the College of Engineering for the period July 1, 1969 through June 30, 1971. Included are publications of U. S. Government staff affiliated with the College of Engineering. The publications by members of various departments are listed alphabetically by senious departments are listed alphabetically by senious departments in the College of Engineering are cross-referenced with appropriate notes. The reports include topics related to agricultural en-

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SCIENTIFIC AND TECHNICAL INFORMATION—Field 10

Preparation of Reviews-Group 10F

gineering, atmospheric science, civil engineering, electrical engineering, mechanical engineering, fluid mechanics, hydraulics, hydrology, hydromachinery, sanitary engineering, and water management. (Woodard-USGS)

REPORT ON GROUNDWATER, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 02F. W73-06407

10F. Preparation of Reviews

COAL AND COAL MINE DRAINAGE, Bituminous Coal Research Inc., Pittsburgh, Pa. For primary bibliographic entry see Field 05G. W73-06006

FERMENTATION INDUSTRY - PHARMACEU-TICALS, CORN, SUGAR, Oklahoma State Univ., Stillwater. For primary bibliographic entry see Field 05B. W73-06010

WATER WELL CONSTRUCTION TECHNOLO-GY, PART 1 - AN INTRODUCTION, National Water Well Association, Columbus, Ohio. For primary bibliographic entry see Field 08A. W73-06192

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| W73-06214 | 20 | W73-06293 | 5D | | W73-06372 | 4A | | W73-06451 | 5D | |
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| W73-06218 | 2H | W73-06297 | 3C | 13060-1737 | W73-06376 | 5C | Line Control | W73-06455 | 6D | COURSE TO SE |
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- ▶ Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- ▶ Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- ▶ Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- ▶ Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- ▶ Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- ▶ Water well construction technology at the National Water Well Association.
- ▶ Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- ▶ Public water supply treatment technology at the American Water Works Association.

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- ► Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- ► Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- ▶ Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- ▶ Water treatment plant waste pollution control at American Water Works Association.
- ► Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

NATURE OF WATER

2 WATER CYCLE

WATER SUPPLY AUGMENTATION AND CONSERVATION

WATER QUANTITY MANAGEMENT

WATER QUALITY MANAGEMENT AND PROTECTION

WATER RESOURCES PLANNING

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